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1 Introduction & Background

1.1 Introduction

Kilkenny County Council (KCC), in collaboration with the Office of Public Works (the funding authority for the scheme), intends to undertake engineering works along the Ballyhale River and its tributaries with the objective of minimising the risk of flooding in the village of Ballyhale.

The objective of this project is the identification, design, and submission (for planning consent) of a Flood Relief Scheme, that is technically, socially, environmentally, and economically acceptable, to alleviate the risk of flooding to the community of Ballyhale. Kilkenny County Council is the Contracting Authority and the Client for the Project. The Office of Public Works is providing funding.

The Environmental Impact Assessment Report (EIAR) presents a systematic analysis of the impact of the Proposed Project in relation to the existing environment and follows guidelines published by the Environmental Protection Agency (EPA). The EIAR document is prepared as part of the Environmental Impact Assessment (EIA) process and will be submitted to the Competent Authority (An Bord Pleanála) as part of the planning process for the project. The EIA process is an iterative one in which the assessment findings are linked back to the design development process.

This report presents a 'Non-Technical Summary' of the EIAR for the Ballyhale Flood Relief Scheme. It is a requirement of the Planning and Development Regulations (2001-2022) that a non-technical summary of the Environmental Impact Assessment Report is prepared. This is because one of the fundamental objectives of the EIA process is to ensure that the public are made aware of the environmental implications of proposed projects. The non-technical summary is generally laid out in a similar, but condensed, format to the main EIAR, i.e. describing the project, existing environment, effects and mitigation measures etc.

This EIAR has been prepared by DBFL and various specialist sub-consultants on behalf of KCC which includes the relevant specialists and their qualifications. The list below presents the experts who contributed to the preparation of the report:

Table 1-1 - Experts who contributed to the preparation of the EIAR

Discipline	Company & Author
Biodiversity	Altemar Marine & Environmental Consultancy <i>Bryan Deegan</i> <i>MCIEEM, M.Sc, BSc</i>
Water Environment	DBFL Consulting Engineers <i>John Carr</i> <i>BEng, MSc, C. Eng, MIEI</i>
Land & Soils	DBFL Consulting Engineers <i>John Carr</i> <i>BEng, MSc, C. Eng, MIEI</i>
Landscape & Visual	Cunnane Stratton Reynolds <i>Evelyn Sikora</i> <i>BA MA MILI</i>
Cultural Heritage	Byrne Mullins Associates <i>Martin Byrne</i> <i>BA MA Dip. EIA Mgmt MIAI</i>
Population and Human Health	McCutcheon Halley Planning Consultancy <i>Majella O'Callaghan</i> <i>BA (Hons) Geography and Economics, MSc Urban and Regional Planning and Diploma in Project Management</i>
Air Quality	Aona Environmental <i>Mervyn Keegan</i> <i>BSc, M.Sc, MIEMA</i>
Noise and Vibration	Aona Environmental <i>Mervyn Keegan</i> <i>BSc, M.Sc, MIEMA</i>
Material Assets	DBFL Consulting Engineers <i>John Carr</i> <i>BEng, MSc, C. Eng, MIEI</i>
Traffic and Transportation	DBFL Consulting Engineers <i>Mark Kelly</i> <i>BAI, MSc, MA, PGDipPM, CEng</i>

1.2 Background to the Scheme

1.2.1 Scheme Objectives

The objective of this project is the identification, design, and submission (for planning consent) of a Flood Relief Scheme, that is technically, socially, environmentally, and economically acceptable, to alleviate the risk of flooding to the community of Ballyhale. Kilkenny County Council is the Contracting Authority and the Client for the Project. The Office of Public Works is providing funding.

1.2.2 Need for the Scheme

Ballyhale is within the catchment of the Little Arrigle River which is a tributary of the River Nore. A tributary of the Little Arrigle River called (for the purposes of this assessment) the Ballyhale River flows through the town of Ballyhale. The Ballyhale River enters the village near the church and splits into two channels either side of the church. A number of culverts/bridges are present on the watercourse along its route through the village. After passing through the village the Ballyhale River flows in a north easterly direction for approximately 1km before its confluence with the Little Arrigle River.

The Office of Public Works (OPW) commissioned the South Eastern CFRAM study to determine locations in Ireland which may be at risk of flooding. The CFRAM was a regional scale study of Flood Risk which predates the current assessment. This study concluded in 2017 and determined that properties in Ballyhale are at risk of flooding for the current day 1% Annual Exceedance Probability (AEP) event. This led to Ballyhale being approved for funding for a Flood Relief Scheme which involved a detailed study of flooding and constraints in Ballyhale.

Kilkenny County Council have appointed DBFL Consulting Engineers to progress the detailed study and develop a sustainable flood relief scheme for Ballyhale.

The study has confirmed that that properties in Ballyhale are at risk of flooding and found that a total of 27 properties were at risk of flooding during the 1% Annual Exceedance Probability flood event.

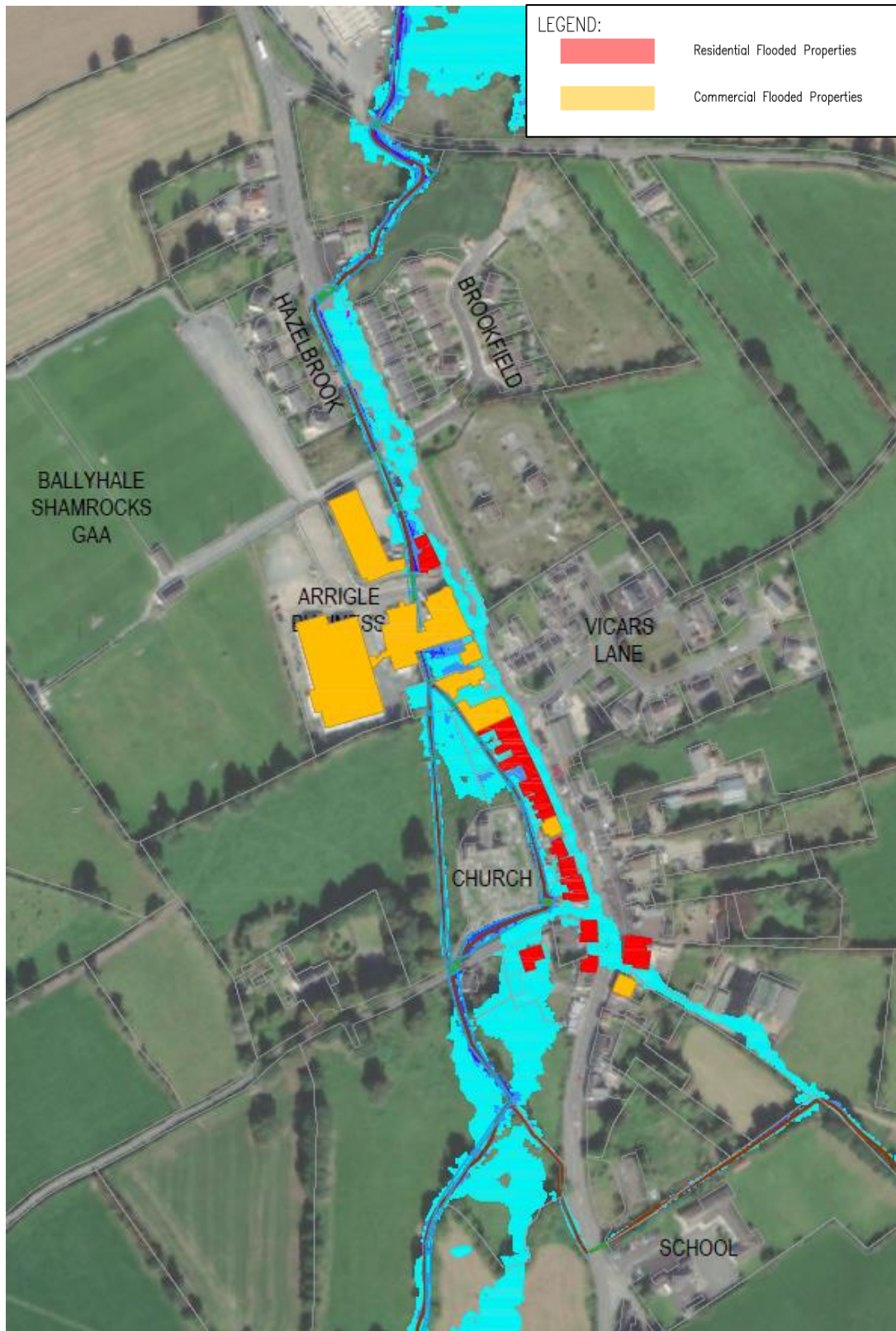


Figure 1.1 Properties subject to Flood Damage Q100 Event

2 Planning & Policy

2.1 Introduction

This Chapter provides an overview of the general planning policy context pertinent to the Ballyhale Flood Relief Scheme (FRS) at national, regional and local level. The application for the FRS is being made to An Bord Pleanála, in accordance with Section 175 and 177 AE of the Planning and Development Act 2000, as amended.

2.2 National Level

Report of the Flood Policy Review Group 2004

In 2004, a review of the national flood risk management policy was undertaken. The OPW were appointed to co-ordinate the delivery of flood risk policy as lead agency as per the recommendations of the report. The Government also aimed to address flooding by:

- Prevention - avoid construction in flood-prone areas.
- Protection – take measure to protect against flooding.
- Preparedness – planning and responding to reduce the impacts of flood events.

European Communities Assessment and Management of Flood Risks Regulations 2010 and 2015

The EU Floods Directive (207/60/EC) was transposed into Irish Law through the EU Community Regulations. The OPW is responsible for formulating and implementing measures to deal with flooding in Ireland.

Office of Public Work Climate Change Sectoral Adaption Plan, Flood Risk Management 2015-2019

This document is the current plan by the OPW for adaption. It is a document that sets out an approach and framework for climate change based on current understandings of flooding and flood risk in Ireland.

National Adaption Framework 2018

The Department of Communications, Climate Action and the Environment's National Adaption Framework (NAF), Planning for Climate Resilient Ireland (January, 2018) was development under the Climate Action and Low Carbon Development Act. The NAF provide a framework to ensure local authorities, regions and key sectors can assess key risk of climate change and consider adaption measures. It is reviewed every 5 years.

Adaptions are undertaken to address current and future risks posed by climate change.

Local Authority Adaption Strategy Development Guidelines 2018

These are statutory guidelines published by the Department of Communications, Climate Action and the Environment, describe the framework and methodology to be followed by local authorities.

Ireland 2040: The National Planning Framework

The National Planning Framework (NPF), published in February 2018, is a strategic plan for managing growth, using state lands and supporting strengthened more environmentally focused planning at local level.

Strategic Flood Risk Assessment

At the draft stage of the NPF process, a high-level flood risk appraisal - 'Strategic Flood Risk Assessment Report' was carried out by RPS in September 2017. It identified high level risk and spatial planning issues for the country and set out a policy framework for local authority development plans.

No specific information relating to Kilkenny is in the document, however it mentions fluvial risk in the Southern Region including the river Nore.

2.3 Regional Level

Southern Regional Economic and Spatial Strategy

The Southern Regional Authority recently adopted the Regional Spatial Economic Strategy (RSES). This encompasses Kilkenny as well as the surrounding Southern region. The RSES sets out 229 regional strategic outcomes in line with the National Strategic Outcomes of the NPF.

The Ballyhale FRS is aligned with the regional strategic outcomes on Climate Action including water, waste and other environmental resources, climate resistance and green infrastructure.

The Regional Policy Objectives (RPO) related to flooding include:

- RPO 113 Floods Directive
- RPO 114 Flood Risk Management
- RPO 115 Flood Risk Management Plans
- RPO 116 Planning System and Flood Risk Management
- RPO 117 Flood Risk Management and Biodiversity
- RPO 118 Flood Risk Management and Capital Works
- RPO 119 Flood Risk Schemes
- RPO 120 Flooding and Coastal Erosion

2.4 Local Level

Kilkenny County Development Plan 2021-2027

Kilkenny County Development Plan (KCDP) outlines the policies relevant to the County. The plan deals with flooding by aligning its policies and objective with the Strategic Objectives of both the NPF and the RSES.

Climate Adaption and Resilience

The strategic aims are outlined in Chapter 2 of the Kilkenny County Development Plan 2021-2027.

Trees and Hedgerows

Chapter 9 of the KCDP acknowledges trees, hedgerows, biodiversity and landscape character. They also note the vital role these contribute to minimise flooding and increase climate adaption/mitigation methods.

Inland Watercourse

Section 9.2.6 of the KCDP outlines the important role that rivers, streams, wetlands and groundwater play. Relevant planning application should have regard to the guidance document by Inland Fisheries Ireland – Planning for Watercourses in the Urban Environment (2020)'.

2.5 Water Framework Directive

The Water Framework Directive (WFD) sets out a strategic response to the threat of pollution which aims to prevent further deterioration of water quality, restore 'good' status of water quality and reduce chemical pollution of water sources.

2.6 Climate Change Adaption Strategy 2019-2024

Kilkenny County Council prepared a Climate Change Adaption Strategy for the period 2019-2024 which informs the policies and objectives of the KCDP. The Strategy contains 95 individual actions under five Adaption Action Headings within the Flood Resilience identified as one of the main areas of focus.

2.7 Cumulative Impacts

Cumulative effects can result from the combination of potential impacts of the development being assessed with a number of other developments and land management practices such as agricultural, industrial and waste water treatment.

A search of Kilkenny County Council Planning database was carried out to identify proposed or permitted projects in proximity to Ballyhale that might result in cumulative environmental

impacts when considered in combination with the proposed flood relief scheme. These projects are assessed for potential cumulative impacts by each discipline within the EIAR.

3 Consultation

3.1 Introduction

This chapter outlines the consultation activities undertaken in advance of the lodgement of the planning application for the Proposed Project. It also summarises the main issues identified during this process and identifies the main modifications to the Proposed Project arising from the consultation process.

3.2 Consultation Events

It is noted that due to government Covid-19 restrictions much of the consultation has taken place via online methods supplemented by on-site discussions with landowners and other interested parties. Communication with stakeholders, local residents, businesses, landowners and other interested parties is summarised below;

- Initial Consultation 11th May 2020 to 11th June 2020 – An online information gathering event was undertaken to gather information from local residents, business and landowners on their views and knowledge of the community. All event material was available on Consult.Kilkenny.ie
- EIAR Scoping September 2020 – Various stakeholders were invited to response on any potential environmental consequences they may perceive from the construction and / or operation of the initial scheme.
- Public Consultation No 2. Emerging Preferred Scheme - 30th July 2021 to 30th August 2021 – A online consultation event was undertaken via Consult.Kilkenny.ie with the preferred emerging scheme on display to gather comments from the local community. A letter / leaflet drop took place across Ballyhale to alert residents of the consultation event.
- Online Consultation Event - 19th August 2021 –As part of Public Consultation No 2, An online presentation event was held with a Q&A session where attendees were encouraged to comment on or ask questions on the material for the presentation or the scheme as a whole.
- Property Impact Consultation – June 2022 – A letter / leaflet drop took place to alert landowners to the impacts on their land by the proposed scheme. This was followed up by in person meetings where possible to encourage landowners to raise any concerns regarding land impacts.
- Additional Non-Statutory Consultation – Information on the emerging scheme was provided to Kilkenny County Council Departments (including Water Services and Heritage departments). Additional Consultation was also carried out with NWPS

and Inland Fisheries Ireland to present the updated Emerging preferred scheme which had been updated from information provided with the Scoping Report

These events were undertaken to alert concerned parties to the scheme and to engage with stakeholders, local residents, businesses, landowners and other interested parties. Information gathered at these events was fed into the design process of the flood scheme and helped to mould the flood scheme.

3.3 Summary

As demonstrated throughout this Chapter, extensive consultation has been carried out with Landholders and other Stakeholders throughout the scheme development.

Information on the scheme has been readily provided to all affected parties and multiple opportunities to provide input to the scheme design have been offered. Where possible, feedback received during consultation has been reflected in the Scheme as presented for Statutory Approval.

Statutory Consultation will also be facilitated through the Planning process.

4 Alternatives Considered

4.1 Introduction

The EIA Directive requires an EIAR to contain:

‘A description of the reasonable alternatives (for example in terms of project design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.

4.2 Scheme Development Process

The development of the proposed Flood relief scheme has been a multi staged process with consideration of a wide range of alternatives in order to arrive at the final flood relief scheme design.

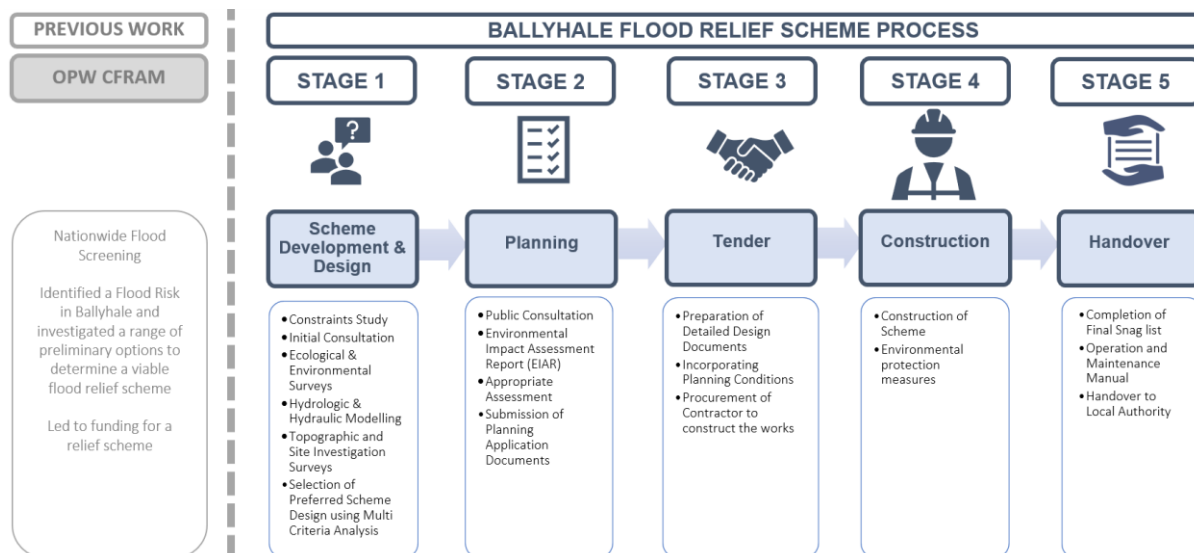


Figure 4-1: Scheme Development Process

The development process required a wide range of complementary studies to ensure a robust Environmental and Technical basis for the proposed flood relief scheme. These include

- Environmental Constraints Report [200055-DBFL-XXXX-XX-RP-C-0002]
- Flood Risk Management Option Report [200055-DBFL-XXXX-XX-RP-C-0004]
- Cost Benefit Analysis Report [200055-DBFL-XXXX-XX-RP-C-0005]
- Hydrology Report [M02151-01_DG01]
- Hydraulics Report [M02151-01_DG02]

The EIAR provides a summary of the consideration of alternatives processes with more detailed information provided within the individual project documents. These supporting project documents are available on the project website at <https://www.kilkennycoco.ie/eng/services/roads/flood-relief/ballyhale-flood-relief-scheme/>.

4.3 Option Assessment Methodology

The general approach to Options Assessment and Selection is outlined in **Error! Reference source not found.** below.

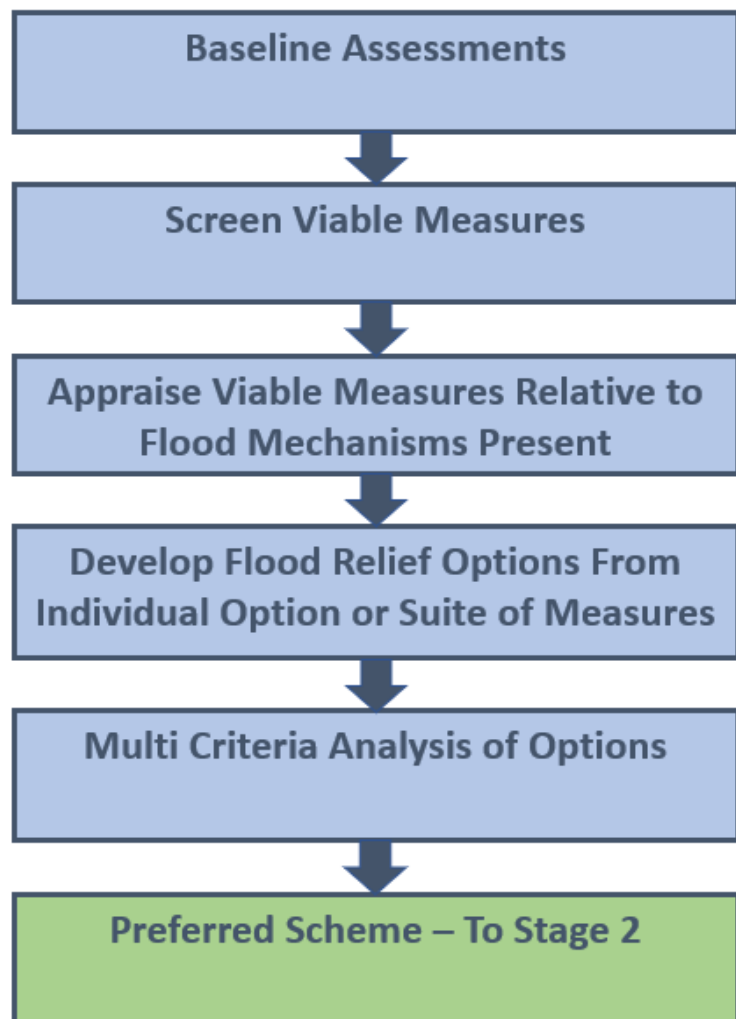


Figure 4-2 Options Assessment and Selection Process

The National 'CFRAM' Programme Technical Methodology Note was used to develop options for the Ballyhale Flood Relief Scheme as it set out certain requirements of the process for the development of flood risk management (FRM) options, including screening, and to set a common approach to the Multi-Criteria Analysis (MCA) for option appraisal.

4.4 Screening

Certain FRM methods would simply not be applicable to certain flood risk circumstances and were rejected on this basis. The flood risk management options which subject to the screening process in the Options Report are contained in Table 4.1.

Table 4-1: Initial Screening of Flood Risk Management Options (Extract from Options Report)

Flood Risk Management Option	Applicability	Social Screening	Economic Screening	Environmental Screening	Cultural Screening	Screening Result
Do Nothing	x					Not Viable
Do Minimum	x					Not Viable
Maintenance Programme	✓	✓	✓	✓	✓	Viable
Flood Forecasting and Warning	x					Not Viable
Individual Property Protection	x					Not Viable
Property Relocation	x					Not Viable
Land Use Management	x					Not Viable
Improvement of Channel Conveyance	✓	✓	✓	✓	✓	Viable
Overland Flood Paths	x					Not Viable
Rehabilitation of Existing Defences	x					Not Viable
Pumping	x					Not Viable
Upstream Flood Storage	✓	✓	✓	✓	✓	Viable
Flow Diversion Structure	✓	✓	✓	✓	✓	Viable
Culverting	x					Not Viable
Hard Defences	✓	✓	✓	✓	✓	Viable
Debris Control Measures	✓	✓	✓	✓	✓	Viable
Natural Retention Measures	✓	✓	✓	✓	✓	Viable

4.5 Development of Flood Risk Management Options

Option A

Option A consists of a range of interventions along the watercourse reach. The general intent of Option A is to enhance the flow capacity and level of defence through the town so that the design flows can be conveyed through the town without causing property flooding.

It seeks to remove the existing flow split at the church and direct all flow to the open channel western branch. This removes flow from the heavily modified and under capacity eastern channel which is adjacent to a number of at-risk properties. It allows a continuous flood defence to be provided between all river flows and the at risk properties.

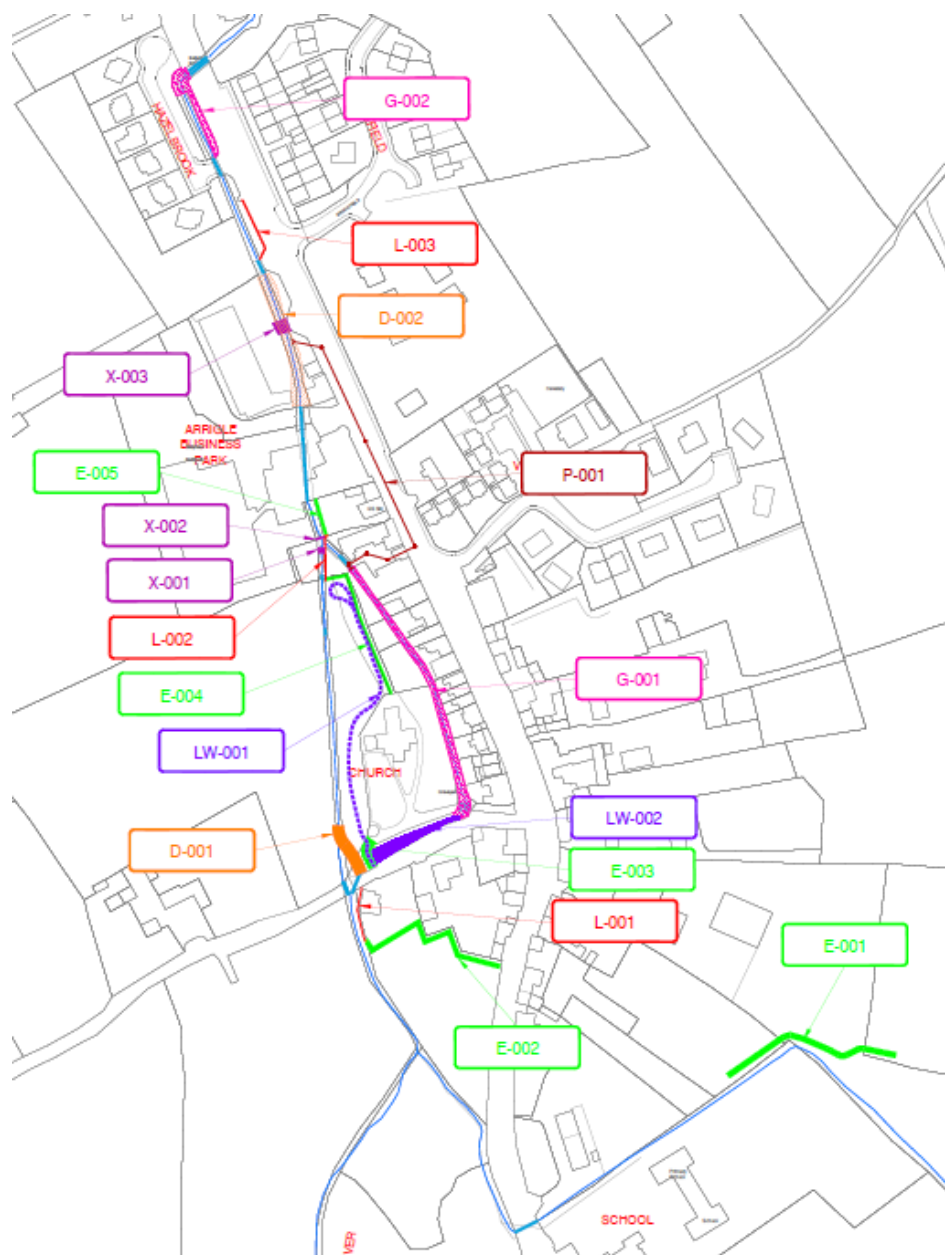


Figure 4-3: Concept Option A Layout

Option B

Option B aims to create an overflow diversion channel to provide a bypass route for flows in excess of the existing flow capacity through the village. It diverts the flow around the village and discharges to the Little Arrigle River. This option is similar to what was proposed in the original CRFAM Options report however the route has been amended to avoid the GAA grounds due to unacceptable social/cultural impacts.

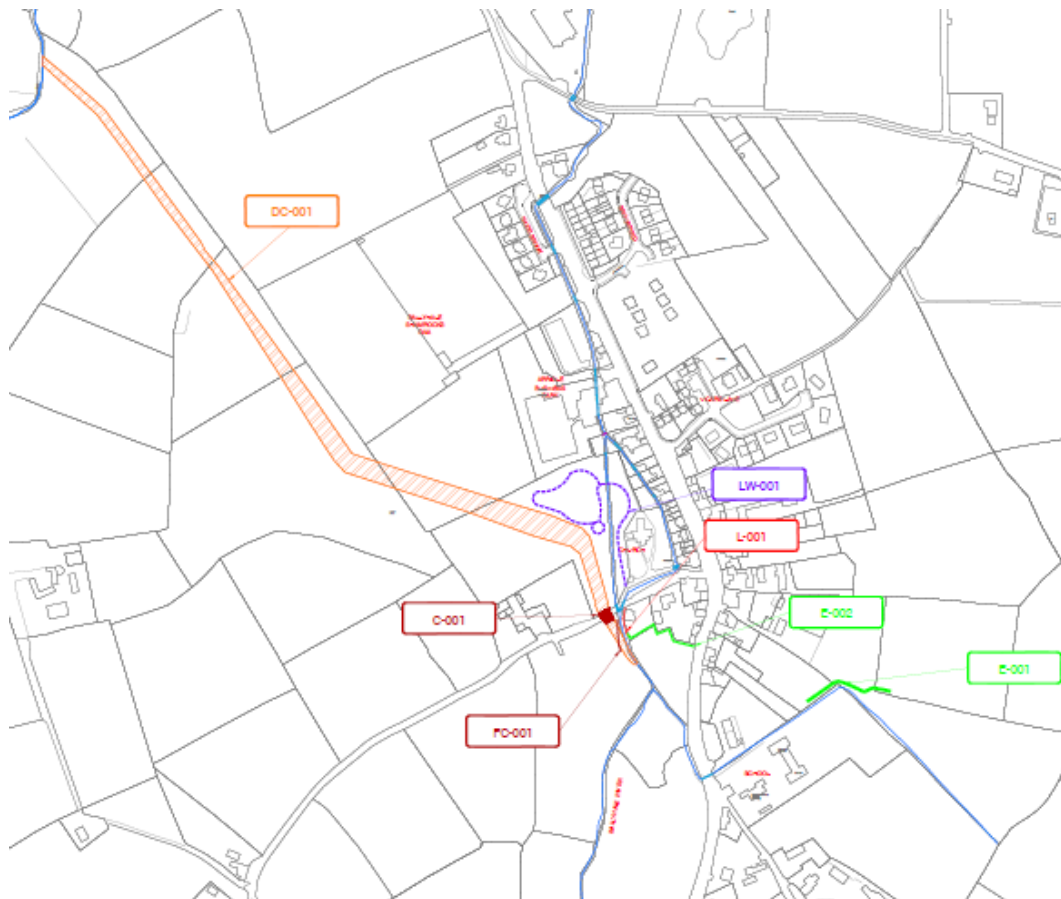


Figure 4-4: Concept Option B Layout

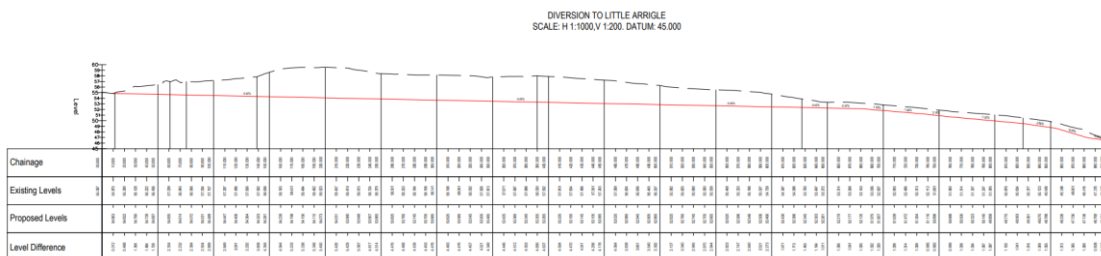


Figure 4-5: Option B Concept Longitudinal Section showing existing and proposed levels

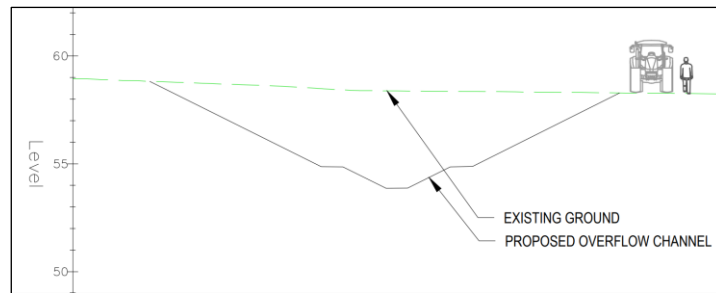


Figure 4-6: Concept Cross Section in deep cut section showing existing and proposed levels

Option C

Option C aims to create an overflow diversion channel to provide a bypass route for flows in excess of the existing flow capacity through the village. It diverts the flow around the village and discharges back into the Ballyhale River downstream of the village.

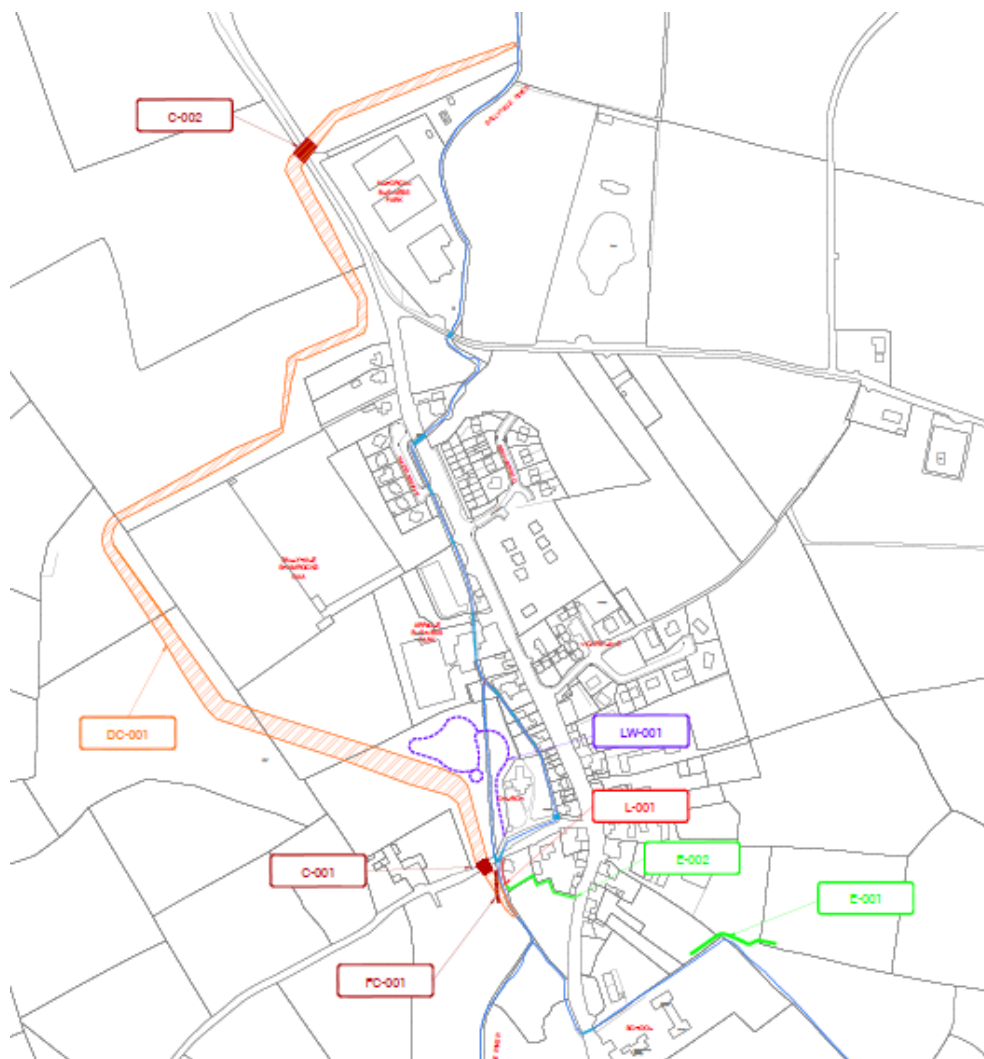


Figure 4-7: Concept Option C Layout (Refer to Appendix 4.4 for Additional Info)

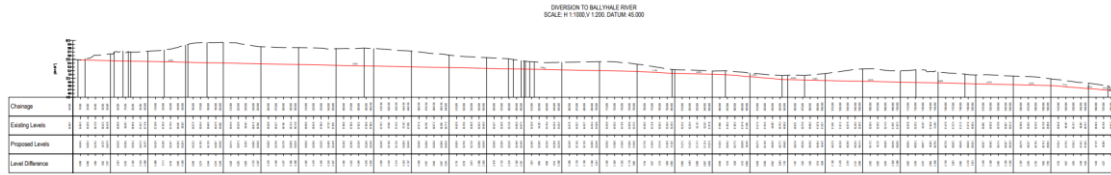


Figure 4-8: Option B Concept Longitudinal Section showing existing and proposed levels

Option D

Option D aims to create an overflow diversion pipe to provide a bypass route for flows in excess of the existing flow capacity through the village. It diverts the flow through a new pipe along the main street and discharges back into the Ballyhale River downstream of the village.

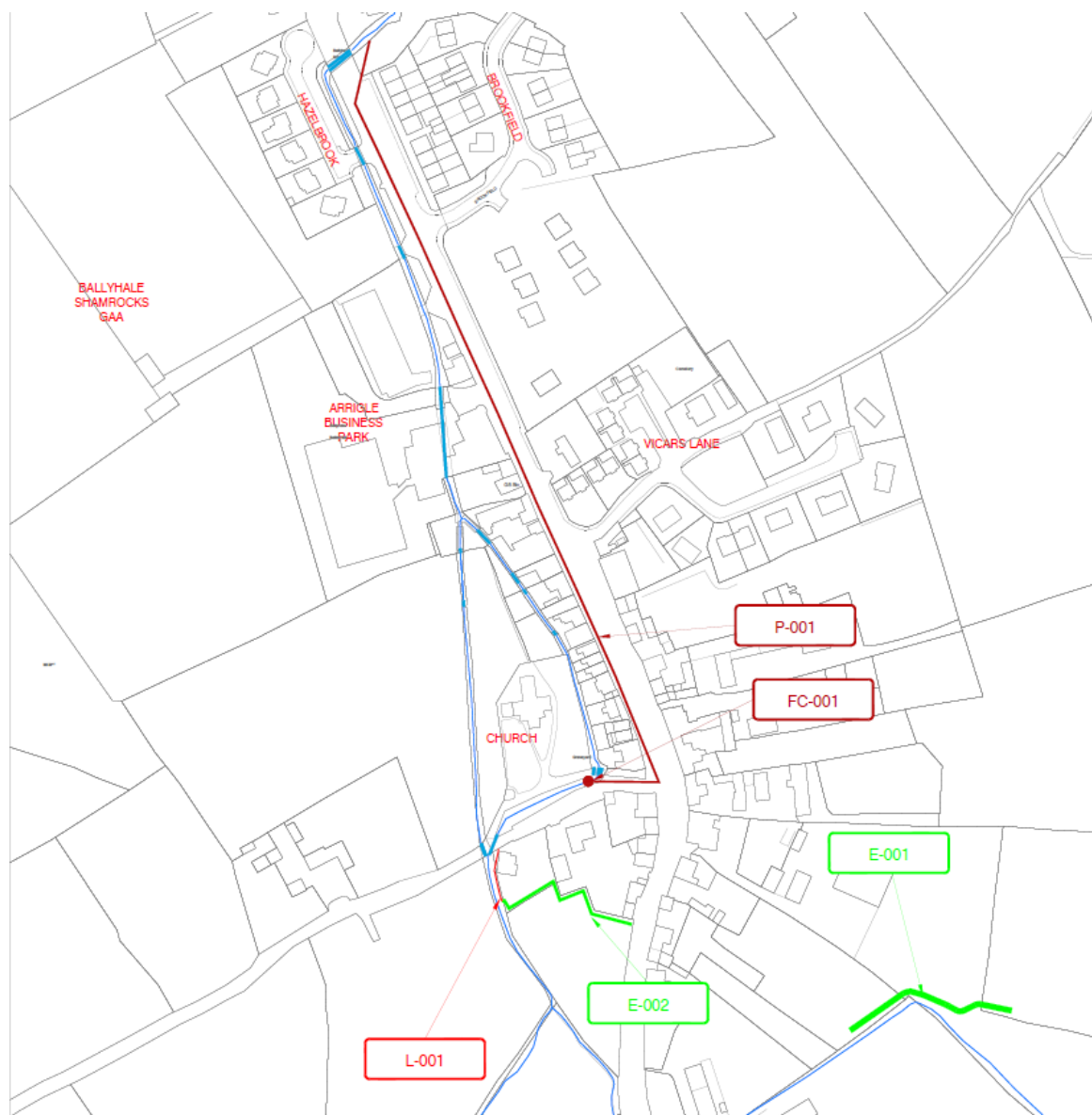


Figure 4-9: Concept Option D Layout (Refer to Appendix 4.4 for Additional Info)

4.6 Multi Criteria Appraisal (MCA)

In order to arrive at the preferred option, the Potentially Viable Options have been subjected to Multi Criteria Appraisal which seeks to take into account the impacts and benefits across various categories to provide for a holistic assessment. The MCA was carried out in line with the OPW's *“Technical Methodology Note - Option Appraisal and the Multi-Criteria Analysis (MCA) Framework”* and are assigned scores under four categories.

1. Social
2. Economic
3. Environmental
4. Technical

The scores had specific minimum requirements and aspirational targets with the Potentially Viable Options scored on the benefits and impacts involved with each option. For each objective there was a Global and Local weighting assigned to the areas of Risk in Ballyhale.

In considering the social dimension during the screening process, outcomes of consultation processes previously undertaken are considered, along with the application of professional judgement and experience in relation to the Social Objectives.

Option A

Option A - Hard Defences and Conveyance Improvements – This option scored high in the Social and Economic Criteria Scores due to it removing the flood risk from the study area.

This option scored high in the environmental objectives relative to the other options due to its low impact on the surrounding landscape and habitats. However, it still would have a temporary negative impact within the stream due to construction elements.

This option scored high in the Technical Criteria as the works are readily adaptable at moderate cost to address potential future flood risk areas with the flood walls and embankments being designed to permit extension in height to maintain a standard of protection to address potential future flood risk areas.

Option B

Option B - Hard Defences & Flow Diversion to Little Arrigle – This option scored high in the Social and Economic Criteria Scores due to it removing the flood risk from the study area.

The low Environmental Score for this option is due to the impacts the diversion channel will have on the surrounding landscape. The diversion channel will remove flow from the Ballyhale Stream and displace this flow to the Little Arrigle. This will influence habitats in the Little Arrigle which makes up part of the River Barrow and River Nore SAC.

This option scored high in the Technical Criteria as the diversion channel is readily adaptable at moderate cost to address potential future flood risk areas.

Option C

Option C - Hard Defences & Flow Diversion to Ballyhale River – This option scored high in the Social and Economic Criteria Scores due to it removing the flood risk from the study area.

The low Environmental Score for this option is due to the impacts the diversion channel will have on the surrounding landscape. The diversion channel will remove flow from the Ballyhale Stream and displace to a location downstream.

This option scored high in the Technical Criteria as the diversion channel is readily adaptable at moderate cost to address potential future flood risk areas.

Option D

Option D - Hard Defences & Piped Flow Diversion – This option scored high in the Social and Economic Criteria Scores due to it removing the flood risk from the study area.

This option scored low due to the diversion pipe removing flow from a point in the stream and displacing it to a lower point downstream. This will have impacts on habitats within the stream.

The low Technical Score in relation to the other three options is due to the piped diversion route not being readily adaptable without significant cost. The option does not however hinder future interventions to address new potential future risk areas. This option also has a very low operational risk requiring regular monitoring and maintenance to check for blockages.

Table 4-2 below presents a comparative assessment of the option scoring.

Table 4-2 Comparative Scoring Table (Extract from Options Report)

Option	Criteria			
	1 Social	2 Economic	3 Environmental	4 Technical
Option A	894.78	489.404	-99	1000
Option B	894.78	489.404	-527	1100
Option C	894.78	489.404	-674	1100
Option D	894.78	489.404	-475	500

Table 4-3: Overall Option Scoring (Extract from Options Report)

Option	Option Selection MCA [Sum of 1-4]	MCA Benefit [Sum of 1-3]	PV Cost	Economic BCR
Option A	2285	1285.18	€1,800,000	2.29
Option B	1810	710.18	€2,500,000	1.65
Option C	1957	857.18	€3,300,000	1.25
Option D	1409	909.18	€2,100,000	1.93

Based on the tables above it can be seen that Option A has received the most advantageous scoring. This option

- Receives the Highest MCA Option Selection Score
- Receives the highest MCA Benefit Score
- Represents the lowest PV Cost
- Provides the Highest Economic BCR

Therefore, as set out in the Options Report, Option A was selected as the preferred option and has been developed into the flood relief scheme as currently proposed for planning.

5 Description of the Proposed Scheme

5.1 Location of the Proposed Scheme

Ballyhale is a town located in the south east of Ireland and located in the South of County Kilkenny. It is located approximately 116km south west of Dublin, 21km south of Kilkenny and 25km north of Waterford. The parish of Ballyhale encompasses the areas of Knockmoylan, Ballyhale and Knocktopher.

Ballyhale and its surrounding hinterland has a very accessible road network though the regional road R448. Ballyhale is predominantly orientated through a North-South axis as a result of its development along the R448.

Ballyhale is within the catchment of the Little Arrigle River which is a tributary of the River Nore. The catchment is located wholly within the jurisdiction of Kilkenny County Council.

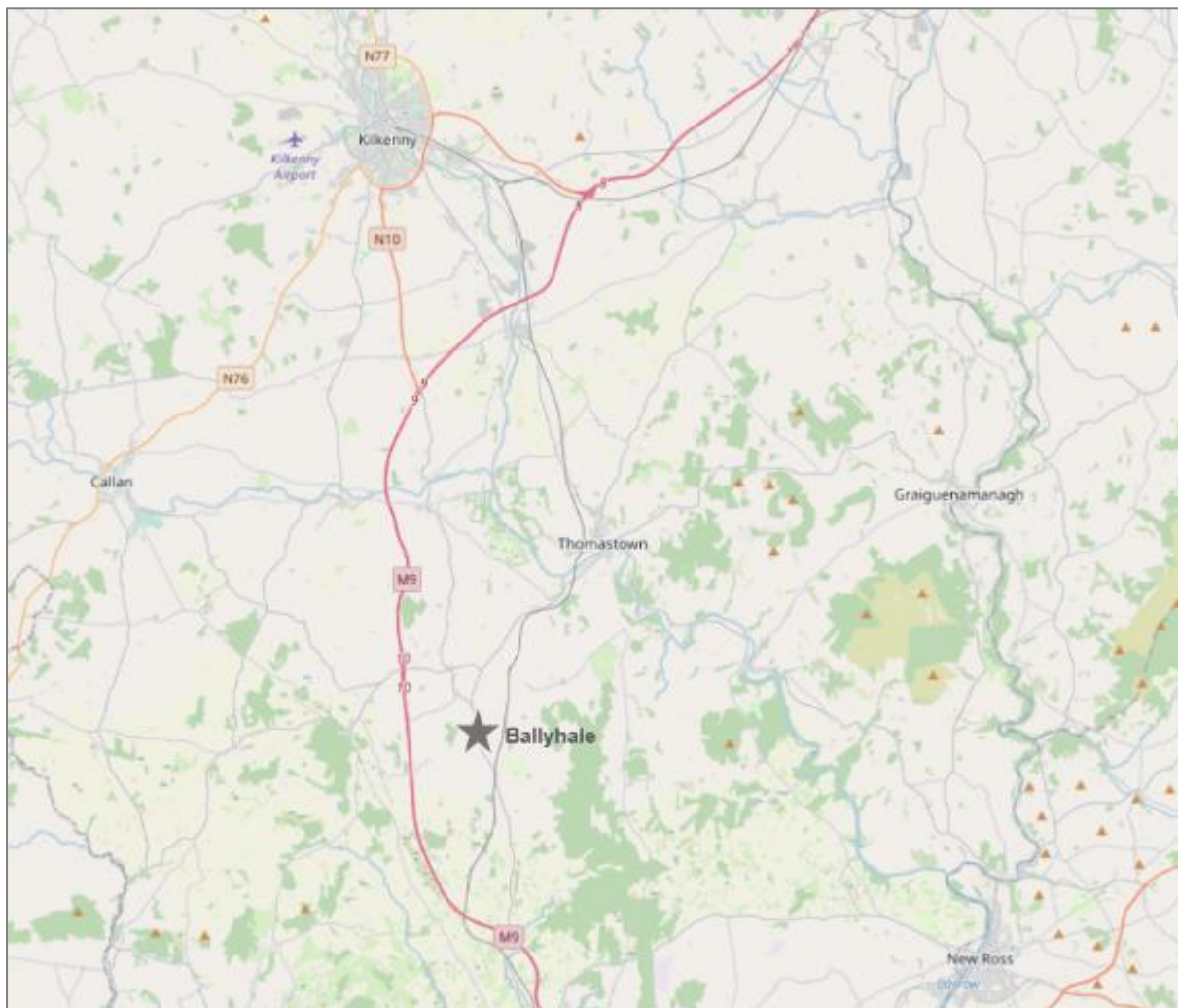


Figure 5-1 Site Location

5.2 Flood Risk Background

In order to understand the existing flood risk environment which, the scheme seeks to address, this section provides a background to the scheme and high-level summary of complementary assessments which include the CFRAM (precursor to current scheme), Hydrology Report & Hydraulics Report.

5.2.1 CFRAM Assessment

The CFRAM was a regional scale study of Flood Risk which predates the current assessment. The South Eastern CFRAM Study Flood Risk Review report (IBE0601Rp0001) identified Ballyhale as an Area for Further Assessment (AFA). The CFRAM study carried out initial hydraulic modelling of the watercourse and determined a flood risk in the Village. The CFRAM Preliminary Option Report (IBE0601Rp0025) identified a range of Preliminary Options to resolve flooding and determined that an Option involving a flow diversion and hard defences may be appropriate to resolve flood risk. The modelling and outline designs in the CFRAM Reports has been reviewed as part of the current project level assessment however these are superseded by the more detailed project level assessment carried out and detailed within this EIAR and supporting project documents.

5.2.2 Catchment Description

Ballyhale is within the catchment of the Little Arrigle River which is a tributary of the River Nore. The main channel of the Little Arrigle runs to the west of the village and a tributary of the Little Arrigle runs through the village. This tributary is also known locally as the Little Arrigle however will be termed the Ballyhale River for the purposes of this assessment (this is also referred to in EPA mapping as Knockwilliam Stream). The Ballyhale River rises approximately 2.9km south of the town of Ballyhale. It begins in a forested region and flows north through largely agricultural land. The Ballyhale River enters the village near the church and splits into two channels either side of the church. The western branch flows in a generally open channel through agricultural land. The eastern channel flows through the rear of a number of domestic properties through a heavily modified channel with frequent structures of varying construction type. The branches merge upstream of Arrigle Business Park and flow through a long (circa 50m) culvert under buildings in the business park. Several additional culverts/bridges are present on the watercourse along its remaining route through the village. A number of weirs are also present on the channel within the village. The Ballyhale River leaves Ballyhale and merges with the Little Arrigle approximately 850 m north of Ballyhale.

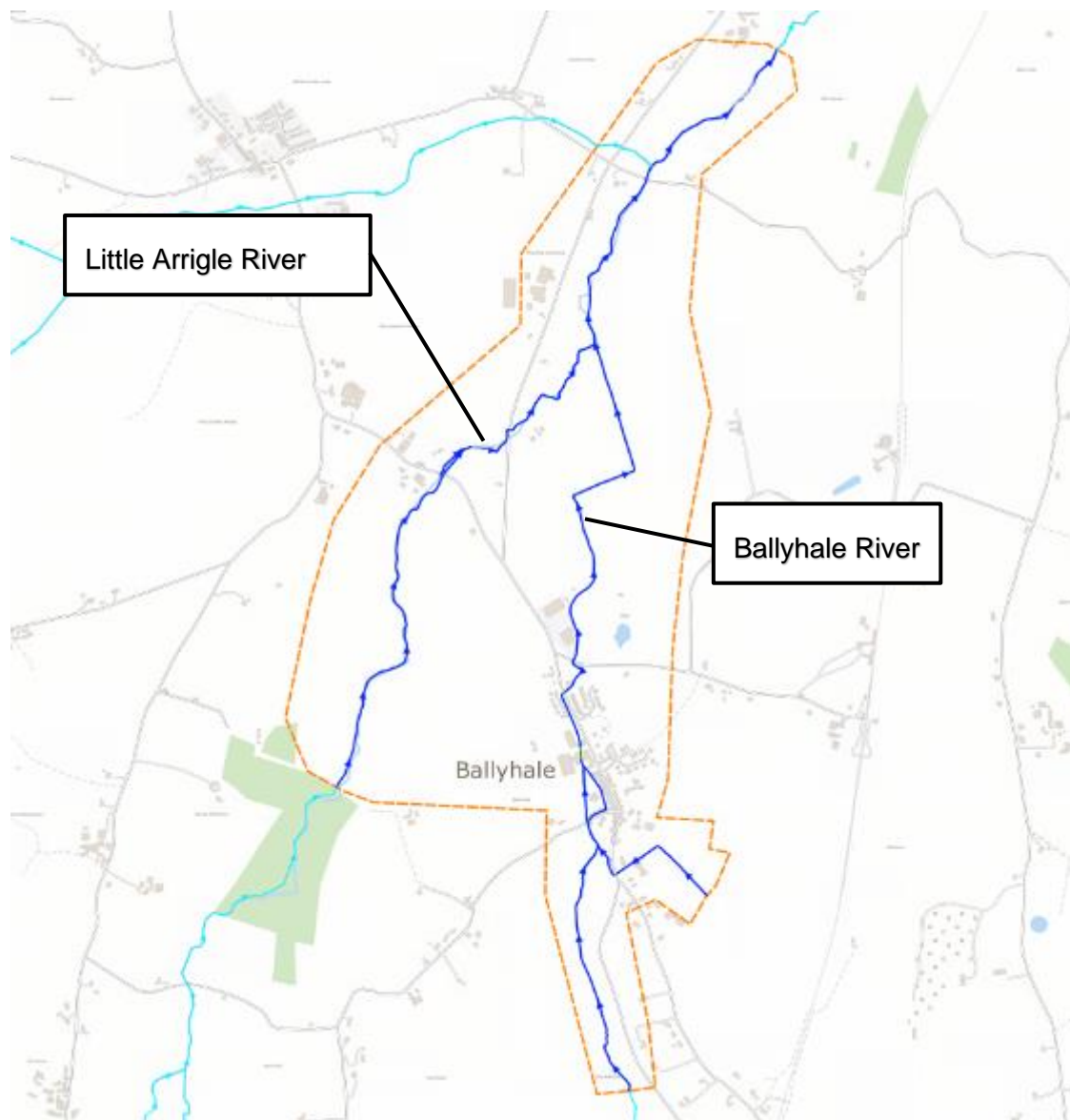


Figure 5-2 Local Watercourse

5.2.3 Existing Flood Risk Environment

A detailed hydrological study and hydraulic modelling of the existing flood risk environment has been carried out as part of this project. The existing flood risk and flood mechanisms are described in the Hydrology Report and Hydraulics Report. The predicted Q100 flood events are shown in Figure 5-3.



*Figure 5-3 Fluvial Flood Extents 1% AEP
(Source – McCloy Consulting – Hydraulics Report Ballyhale, Co. Kilkenny)*

The primary flood mechanism for the flooding within the village is caused by structure incapacity with resulting backwater effect causing out of bank flooding along the Ballyhale River resulting in flooding at the rear of the Main Street properties, coupled with two significant overland flow routes from the south of the village.

Channel incapacity upstream of the village from the Ballyhale River creates an overland flow path that flows northerly towards Chapel Lane, re-entering the western church reach of the Ballyhale River at the church access bridge.

A second overland flow route is evident from an unmapped tributary of the Ballyhale River that flows adjacent to the school boundary. A low point in the bank where the channel turns at an approximately 90-degree bend coupled with unmaintained vegetation restricting flows within the channel downstream causes flooding from the right-hand bank flowing down 'Sheff's Lane' that emerges onto the Main Street. The flow route diverges at the Chapel Lane junction, flows that tend down Chapel Lane enters the western church reach at the church access bridge. Flows that tend down Main Street enters the main Ballyhale River at the former Garda Station.

In higher flow events, the flow path on the Main Street continues and re-joins the Ballyhale River at either the downstream section of the 'Main Street Bridge' at the Hazelbrook development or downstream of the Station Road bridge.

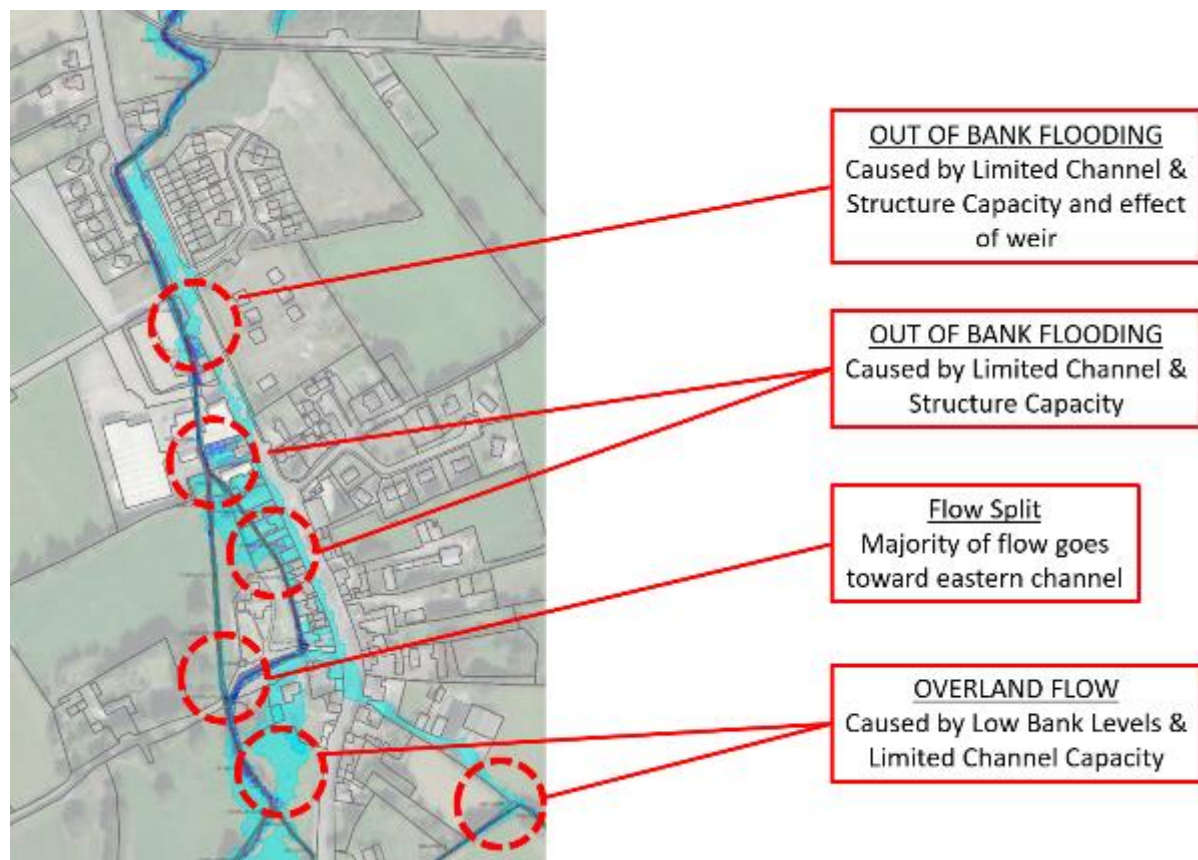


Figure 5-4 Flood Mechanisms - Overview

5.3 The Proposed Scheme

The Flood Relief Scheme consists of a range of interventions along the watercourse reach. The general intent of the Flood Relief Scheme is to enhance the flow capacity and level of defence through the town so that the design flows can be conveyed through the town without causing property flooding.

It seeks to remove the existing flow split at the church and direct all flow to the open channel western branch. This removes flow from the heavily modified and under capacity eastern channel which is adjacent to a number of at-risk properties. It allows a continuous flood defence to be provided between all river flows and the at-risk properties and the principal elements associated with the proposed scheme include the following:

- Embankments located upstream of the village to prevent overland flooding.
- Flood wall to western perimeter of "Arrigle View" Property.
- A section of new river channel re-connecting all outlets from the Chapel Lane bridge into the western river channel and removing the flow split. This will require

excavation of the existing church pedestrian access and replacement via a new pedestrian connection which also serves to form a new bank to the redirected stream.

- Landscaping of eastern river channel to allow for a low flow channel to reflect reduced flow conditions.
- Flood Defences (wall and embankments) between the western channel and the properties at risk on Main St. Lands acquired for these flood defences will be landscaped to provide a riverside walkway/park.
- Removal of one of two existing minor private bridges providing access across the river to a private land parcel.
- Removal of a boundary wall spanning the watercourse
- The existing weir at the Ballyhale Business Park will be removed allowing the channel gradient to be increased along this section which increases capacity. The existing bridge will be removed and replaced with a 6m wide by 1.2m high precast portal culvert.
- Low flood wall alongside the road opposite Brookfield to prevent out of bank flows emerging onto the road surface.
- Provision of rock ramp to existing weir at Ballyhale Shamrocks access to improve fish pass conditions.
- Channel reprofiling at the existing Main St bridge to improve bridge inlet conditions.
- Provision of additional conveyance capacity to the Main Street Bridge. The additional conveyance will be provided by an additional bridge opening (box culvert) set at high level to provide capacity for extreme flood events.
- Provision of rock ramp to downstream face of the Main Street Bridge to improve fish pass conditions.
- Provision of a temporary construction compound.
- Fencing, accommodation works and all site development and landscaping works.

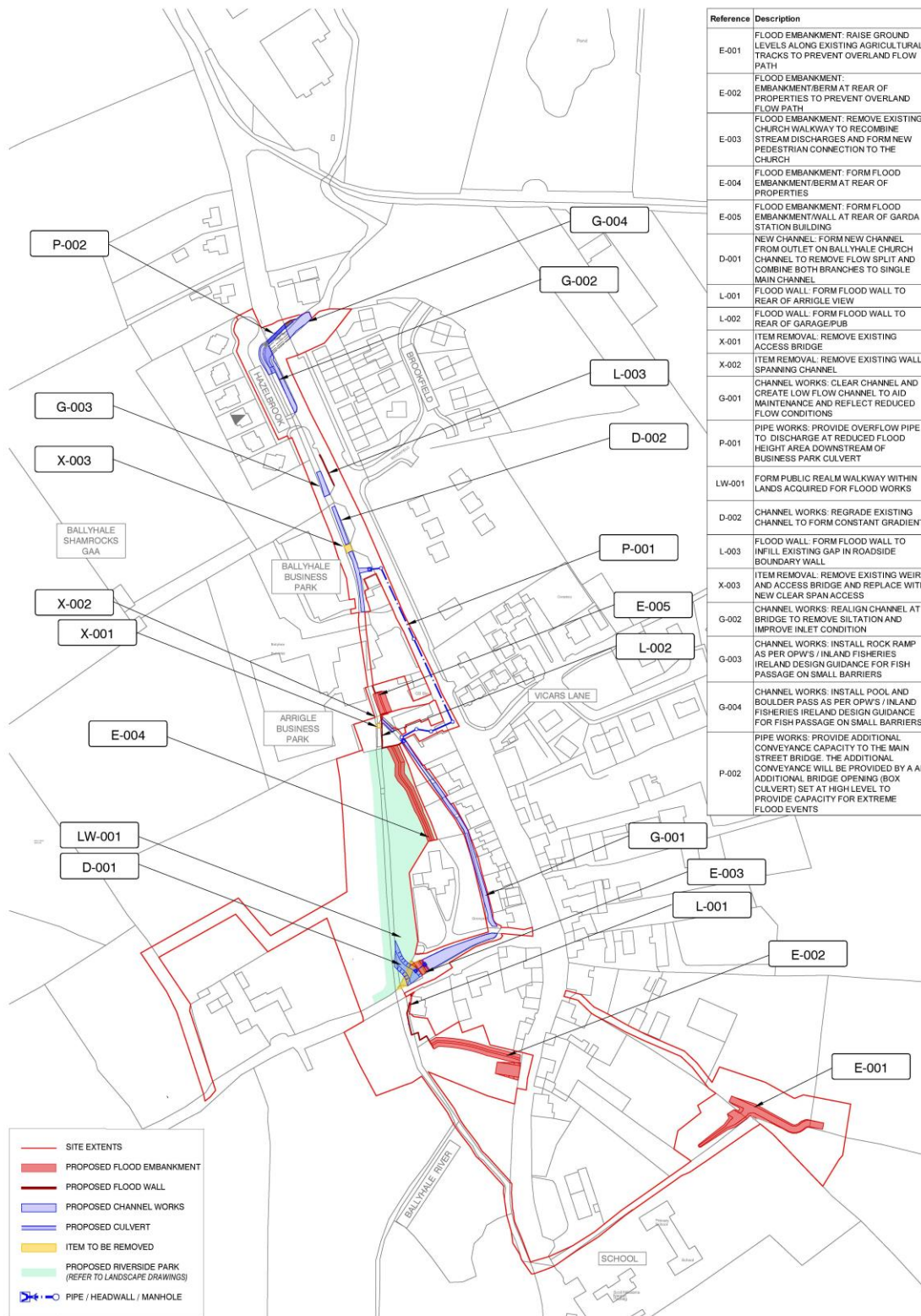


Figure 5-5 Ballyhale Flood Relief Scheme – General Layout

Design Standard

The design standard for this study is the 1% AEP event for fluvial flood risk.

Freeboard

Freeboard is a safety margin to account for uncertainties in water-level prediction and/or structural performance. It is the difference between the height of the flood defence or floor level and the design flood level. Freeboard should account for uncertainty in hydrological predictions, wave action, modelling accuracy, topographical accuracy and the quality of digital elevation models.

The OPW standard freeboard allowance is 0.3m for hard defences and 0.5m for soft defences. This allowance shall be applied to new defences at a minimum and is appropriate for most situations.

The design has made increased freeboard allowance in the locations below:

- A low wall (L-001) is proposed alongside the “Arrigle View” property on Church Lane. Although this property is not anticipated to flood in the baseline scenario, hydraulic modelling indicates that a flow route through and around this property would be anticipated in the event of a blockage of the adjacent bridge. Therefore, providing a defence at this location reduces residual risk to this property and to downstream properties which may be affected by the overland flow. The height of this wall shall be set to retain the flood level associated with a 50% blockage event of the adjacent bridge. Since this bridge is the first structure downstream of a significantly vegetated catchment it is considered at a higher risk of blockage.
- It is proposed to increase the freeboard for defences E-005, L-002 & E-006 such that they would retain the flood level associated with a 50% blockage of the long culvert under Arrigle Business Park. This culvert is considered to have a higher risk of blockage to the length of the culvert, the change in cross section through the barrel and the level of visibility.
- Additional conveyance capacity (P-002) is proposed to the Main Street Bridge. Although this structure is not predicted to flood in the baseline scenario, hydraulic modelling indicates that in a blockage event there is an overland flow path which puts properties at risk. Therefore, additional conveyance at this location will reduce the risk to properties which may be affected by the overland flow path. The additional conveyance will be provided at a high level to only provide capacity for extreme flood events.

Climate Change Adaptability

In the development of options, it is required that the proposals represent solutions which are flexible and can be adapted to the changes in the climate and its potential impact on flood risk over the course of its lifetime.

The scheme has been developed taking consideration the following allowances for future scenarios, namely the Mid-Range Future Scenario (MRFS) and the High End Future Scenario (HEFS).

Table 5-1: Allowances for Future Scenarios

	MRFS	HEFS
Extreme Rainfall Events	+ 20%	+ 30%
Flood Flows	+ 20%	+ 30%
Mean Sea Level Rise	+ 500 mm	+ 1000 mm

The maps included as part of the Hydraulics Report demonstrate the Climate Change Scenarios impact both with and without the scheme.

New hard defences shall ensure that the defence height is sufficient to retain the climate change events within the freeboard allowances.

Climate Change Adaptability has been considered during option selection within the Multi Criteria Analysis under the Technical category.

5.4 Construction

This section outlines the proposed construction phase of the Ballyhale Flood Relief Scheme. Construction of the scheme is dependent on planning approval.

5.4.1 Duration of the Works

It is estimated that the works will be tendered in 2024 with commencement in 2025 and an estimated site programme of approximately 20 months depending on construction phasing.

The primary works elements are anticipated to include:

- Site Setup
- Site Clearance and Demolition
- Earthworks
- Installation of Drainage
- New Structures
- Landscaping & Demobilisation

5.4.2 Construction & Environmental Management Plan

A Construction and Environmental Management Plan (CEMP) has been produced as part of this Planning Application. Prior to any demolition, excavation or construction, the Contractor will take ownership of the CEMP. The Contractor will comply with the conditions of the EIAR and will produce the Construction Stage Construction & Environmental Management Plan to detail how the project is to be executed in accordance with all project, statutory and environmental requirements.

The Construction & Environmental Management Plan is included as Appendix 5-2 of Volume 3. The plan seeks to demonstrate how works can be delivered in a logical sensible and safe sequence with the incorporation of specific measures to mitigate the potential impact on people and the surrounding environment, particularly the residential areas adjacent the site. Upon appointment of a contractor this document will be issued to them to be further developed into their final construction management plan for the project. The final construction management plan will include relevant mitigation measures identified in the EIAR and any further measures agreed and included into the updated Schedule of Mitigation during the planning process. The CEMP will include any conditions imposed by the Competent Authority in making a Determination before being submitted by the contractor to be agreed with the local authority prior to commencement of development.

5.4.3 Construction Compound

Temporary Construction Compound space will be required to provide store, office, material storage, parking and welfare facilities for the contractor and employers representatives. The exact location of the construction compound will be detailed in the Contractors Construction Management Plan which will be submitted to the local authority for approval will be within an area proximate to the works from which safe access to the surrounding road network can be provided and will be located outside environmental restriction zones set out in the EIAR/CEMP. The proposed location of the site compound has been provided in and temporary land acquisition for a compound at this location has been included in the scheme CPO.

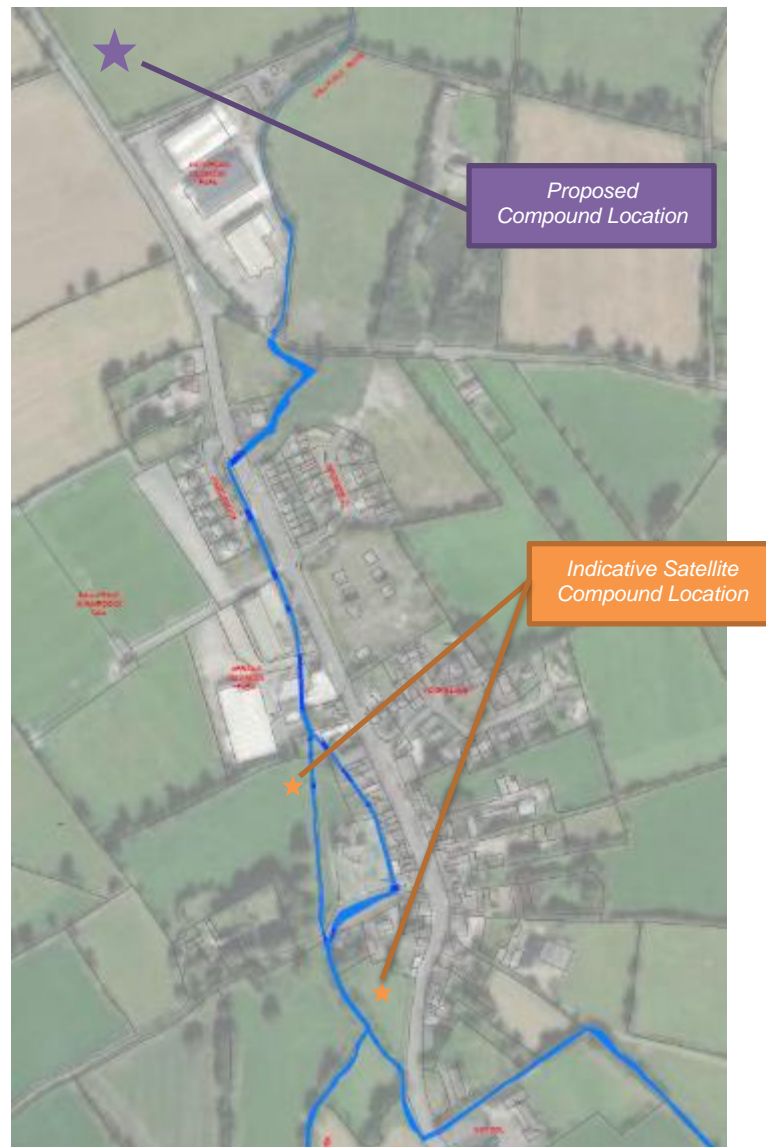


Figure 5-6 Compound Location

5.5 Operation and Maintenance of the Project

5.5.1 Maintenance and Monitoring

As time progresses the natural processes of the environment will change some aspects of the proposed development. Operational measures will be required and will include regular maintenance of the proposed scheme. The natural process which would alter the scheme are as follows:

- Vegetation will continue to grow along the river banks.
- Materials will be carried downstream during flood events and impact the scheme.
- Sediment from surface water runoff will be transported down river.

There may also be the non-natural process which would require inspection and maintenance. These would be as follows:

- Illegal Dumping of materials which would cause a blockage event at one of the various structures within the scheme.
- Illegal alterations of the scheme elements which may reduce the heights of the proposed scheme elements or damage individual elements.

Therefore, maintenance activities will be required as follows:

- Removal of Silt-Build-up, Vegetation and branches impacting on the hydraulic capacity of the river channels will be carried out ensure conveyance capacity is retained within the river channel. This will be carried out in Autumn prior to the winter flood season and it will cover the channel from the Bridge Structure Upstream of D-001 to downstream of G-004.
- Structure faces will be regularly inspected and any debris causing a blockage will be removed. The reinforced concrete and cladding of the proposed structures will be inspected and any required maintenance undertaken.
- The Overflow Pipe will be inspected and cleaned as required.

A regular inspection regime will be carried out on all elements of the scheme to ensure the various elements have not been damaged or altered.

5.6 Decommissioning

Kilkenny County Council considers the Ballyhale Flood Relief Scheme a strategic asset for the protection of Ballyhale town from flooding. The scheme will have a 50-year design life as a minimum and as such it is anticipated that the proposed development will be maintained by Kilkenny County Council in the long term. The elements of the Flood Relief Scheme will not be decommissioned in the foreseeable future as they are required for the long-term protection of the town.

6 Biodiversity

This biodiversity chapter assesses the biodiversity value of the proposed development area and the potential impacts of the development on the ecology of the surrounding area and within the potential zone of influence (ZOI).

6.1 Assessment Methodology

This assessment was carried out in accordance with best practice methodology as noted below.

- EPA 2022 Guidelines and EC Guidance on EIAR
- The European Commission's "Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment" (2013)
- The Environmental Impact Assessment of Projects: Guidance on the preparation of the Environmental Impact Assessment Report, European Commission, 2017
- CIEEM (Chartered Institute of Ecology and Environmental Management) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine, CIEEM 2018

A pre-survey biodiversity data search Field surveys were carried out as outlined in the appropriate seasons. These included terrestrial and avian ecology, bat fauna, aquatic ecology and mammal surveys.

6.2 Baseline

6.2.1 Designated Sites

Works are proposed to the watercourse on site and there is a direct hydrological pathway to Natura 2000 sites (River Barrow and River Nore SAC and River Nore SPA) via the Ballyhale River. This watercourse outfalls to the Little Arrigle River, which in turn outfalls to the River Nore, then the River Barrow, and ultimately outfalls to the marine environment at Waterford Harbour.

6.2.2 Historic data

No species of conservation importance were recorded on site, based on NPWS and NBDC records as fine resolution. However, otter (*Lutra lutra*), bog orchid (*Hammarbya paludosa*) and freshwater crayfish (*Austropotamobius pallipes*) have been recorded proximate to the site. The site is located within a designated Freshwater Pearl Mussel (Margaritifera (Marga ritifera) Margaritifera) sensitive area, but there are no specific recordings of Freshwater Pearl Mussel (Margaritifera (Marga ritifera) Margaritifera) located proximate to the subject site.

6.2.3 Aquatic Flora and Fauna

The habitat quality and records indicate that the stream would support, Atlantic salmon (*Salmo salar*), brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*) and sea lamprey (*Petromyzon marinus*) requirements for spawning, nursery and adult habitat. In addition, the watercourse supports otter (*Lutra lutra*) and crayfish (*Austropotamobius pallipes*). Signs of otter activity were noted. However, several barriers are in place on the river within the site and these would impede fish movements.

6.2.4 Bats

Common pipistrelle, soprano pipistrelle, Leisler's bat, Daubenton's bat, brown long-eared bat and Natterer's bat were noted during the survey. Three of the bat species recorded were common pipistrelle, Leisler's bat and soprano pipistrelle and these are the three most common bat species in Ireland. The remaining three bat species are less common but are associated with specific habitats.

6.2.5 Terrestrial Ecology

During the site visits no terrestrial flora or fauna of conservation importance were recorded on site adjoining hedgerows or in NPWS or NBDC records. No other terrestrial mammals of conservation importance were noted on site. No badger activity or setts were noted. No otter activity or holts were noted on site but otters are downstream of the works. Impacts on water quality and noise during construction could potentially cause impact on the prey and disturbance, of otter respectively.

Common mammalian species. Loss of habitat and habitat fragmentation may affect some common mammalian species e.g house mouse, brown rat and there is expected to be mortality during construction.

Amphibians and reptiles. Frogs and reptiles were not observed on site. However, the Knockwilliam Stream flows through the site and frogs may occur on site. The common lizard may occur on site but, was not observed.

6.2.6 Avian Ecology

No bird species of conservation importance were recorded on site or in NPWS or NBDC records. However, evidence of dipper was noted directly downstream of the proposed works.

Potential Impacts of the Proposed Development

The construction of the proposed development will impact on the existing ecology of the site and the surrounding area. These potential construction impacts will include impacts that may arise during the terrestrial and instream works. It should be noted that the works are proposed immediately upstream of the River Barrow and River Nore SAC and there is potential for significant impact on the qualifying interests of the designated site in the absence of mitigation measures. Construction phase mitigation measures are required on site particularly as significant instream works are proposed which will remove all existing habitats within the watercourse and can lead to silt laden and contaminated runoff going downstream. There is potential for silt laden runoff and contamination to enter the watercourse with potential for downstream impacts.

Once constructed, the waterflows to the west of the village in the section (Plate 6) will increase although no works are proposed in this area. The biodiversity value of the site will be expected to improve due to increased waterflows. Currently, the watercourse is divided into two separate flows which is resulting in a suboptimal flow for biodiversity and fish passage to the west and within the village. It will be expected that the ecological impacts in the long term will be positive due to the removal of barriers to fish movements and the increase in volume within the watercourse to the west of the town.

6.3 Mitigation Measures

A strict series of mitigation measures will be incorporated into the proposed development to minimise the potential negative impacts on the ecology and designated sites within the ZOI. These measures are outlined below in sequence and incorporate elements outlined elsewhere in this EIAR and in the NIS.

Construction and operational controls will be incorporated into the proposed development project to minimise the potential negative impacts on the ecology within the Zone of Influence (Zoi) including the Knockwilliam Stream, Little Arrigle Stream, River Nore, and River Barrow.

6.4 Adverse Effects likely to occur from the project (post-mitigation)

With the successful implementation of standard mitigation measures to limit surface water impacts on the Knockwilliam Stream and biodiversity mitigation/supervision, no significant impacts are foreseen from the construction or operation of the proposed project. Residual impacts of the proposed project will be localised to the immediate vicinity of the proposed works. Positive impacts will be seen through the increased instream flows to the west of Ballyhale.

The construction and operational mitigation proposed for the development satisfactorily addresses the mitigation of potential impacts on biodiversity and designated conservation sites through the application of the standard construction and operational phase controls as outlined above. In particular, mitigation measures to ensure compliance with Water Pollution Acts and prevent silt and pollution entering the stream will satisfactorily address the potential impacts on downstream biodiversity and Natura 2000 sites. No significant adverse impacts on the conservation objectives of Natura 2000 sites are likely following the implementation of the mitigation measures outlined above. The overall impact of the project on the ecology of the proposed development will result in a long term moderate positive not significant residual impact on the ecology of the area and locality overall. This is primarily as a result of the creation of an improved waterflows and limiting of livestock access to the watercourse, to the west of the village, standard construction and operational controls, improved fish passage through the site and a sensitive native landscaping strategy.

7 Water Environment

The potential effects of the construction and operation of the Ballyhale Flood Relief Scheme with regard to the Water Environment have been assessed by classifying the sensitivity of water receptors and quantifying the magnitude of impact on these receptors. The significance of the identified potential impacts is acknowledged by the combination of the sensitivity of the receptor and the magnitude of the potential impact.

Ballyhale is within the catchment of the Little Arrigle River which is a tributary of the River Nore. The main channel of the Little Arrigle runs to the west of the village and a tributary of the Little Arrigle runs through the village. This tributary is also known locally as the Little Arrigle however will be termed the Ballyhale River for the purposes of this assessment (this watercourse is also referred to in EPA mapping as Knockwilliam Stream). The Ballyhale River enters the village near the church and splits into two channels either side of the church. Several culverts/bridges are present on the watercourse along its route through the village.

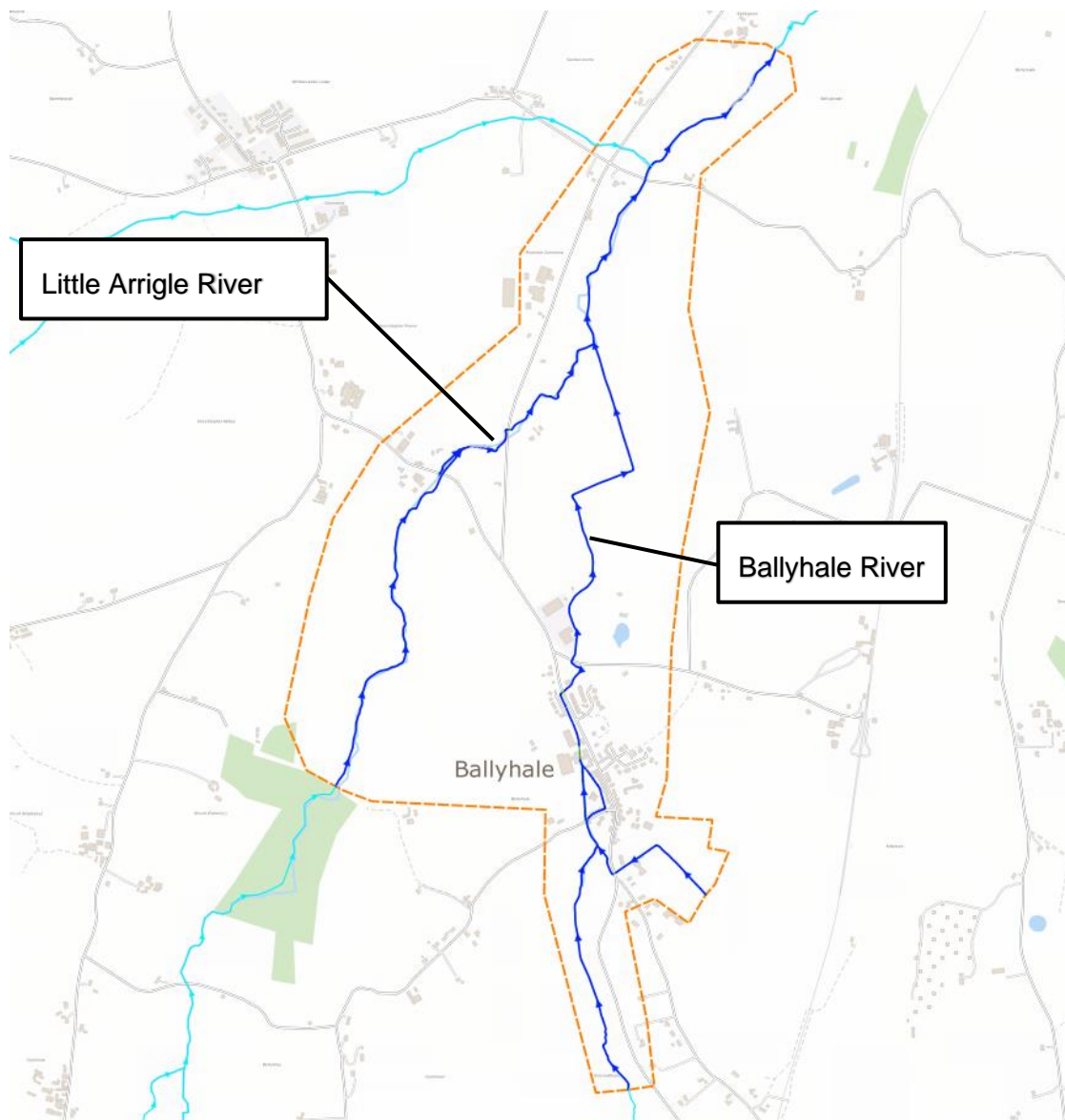


Figure 7-1 Local Watercourses

The bedrock aquifer underlying the entire site is classified by Geological Survey Ireland as a “Regionally Important Aquifer-Fissured bedrock”.

No Drinking Water Protection Areas were identified in the vicinity of the site however protection zones are present on the aquifer near Thomastown where there are abstractions for drinking water supplies.

The Little Arrigle River has been assigned as “At risk” status under WFD classifications. The watercourse (Knockwilliam_010) is classified as Moderate under the WFD in the direct vicinity (Ballyhale River) of the site and the Little Arrigle River is also classed as Moderate downstream of the site near its confluence with the Nore. The Nore is also classified as Moderate at this location.

The potential adverse Impacts identified are;

- Chemical Pollution of the water environment,
- Pollutions of watercourses by silt / suspended solids,
- Changes to Stream Channels, and
- Changes to runoff and flow patterns.

7.1.1 Operational Impacts

The existing watercourse in Ballyhale is heavily modified and the scheme design has sought to return the stream to natural conditions wherever possible. Measures include the removal of weir structures and the removal of the artificial flow split. Fencing will be introduced in some areas where previously the stream banks were subject to poaching by cattle. Flood defences where proposed are beyond the stream banks and therefore only affect flood routing during extreme events and maintain normal flow conditions in the channel. These measures are considered to result in a slight positive effect on stream morphology.

The proposed Scheme will provide protection up to the 1% AEP flood event. This will result in a significant long-term positive impact due to the reduction in flood damages.

The proposed flood defences will prevent the flood waters from following through properties and roads, washing contaminants into the river. This will significantly improve the Ballyhale Rivers water quality.

An inspection and maintenance regime will be carried out throughout the lifetime of the proposed scheme to ensure the Flood Defence Scheme remains in an effective condition. Channel and embankment maintenance operations can encompass a variety of activities, including silt and vegetation management, aquatic vegetation cutting, bank protection, bush cutting/branch trimming, tree cutting, mulching, mowing and structure maintenance.

7.2 Mitigation Measures

Mitigation measures include silt management and pollution prevention measures and best practice design and construction approaches will be implemented to mitigate against chemical pollution and pollution by silts/suspended solids.

7.3 Conclusions

Post mitigation impact significance for all identified adverse impacts has been determined as Not Significant.

The proposed Scheme will provide protection up to the 1% AEP flood event. This will result in a significant long-term positive impact due to the reduction in flood damages.

8 Land and Soils

The potential effects of the construction and operation of the Ballyhale Flood Relief Scheme with regard to Land and Soils have been assessed by classifying the sensitivity of land and soil receptors and quantifying the magnitude of impact on these receptors. The significance of the identified potential impacts is acknowledged by the combination of the sensitivity of the receptor and the magnitude of the potential impact.

The Ballyhale Flood Relief Scheme is underlain in its majority by Kiltorcan Formation, which is underlain by Porters Gate Formation at the northern end of the scheme. The Kiltorcan Formation generally consists of yellow and red sandstone and green mudstone. This formation is characterized by thick, non-red sandstones, often in channel forms, intraformational conglomerates and both red and non-red mudstones. Sandstones are yellow and coarse-grained as well as micaceous with white and red hues. The Porters Gate Formation is generally consist of sandstone, shale and thick limestone. The formation is a gradational sequence consisting of grey flaser bedded sandstones and interbedded sand-lensed mudstone passing up to sandy bioclastic limestones and then to grey mudstones, thin sandstones and thin bioclast.

A number of bedrock outcrops in the vicinity of the site were noted on geological mapping and some bedrock was visible within stream channels during site walkovers.

No existing areas of contaminated ground have been identified within the scheme. Historical site uses do not appear to indicate heavy industrial use or contamination history. During site investigations environmental testing was carried out on samples from all trial pits.

The predicted impacts of the scheme identified on Land and Soils are;

- Chemical Pollution of geological receptors,
- Loss of soil value, and
- Material generation.

Best practice design and construction approaches will be implemented to mitigate against chemical pollution. All soil handling to be in line with best practice guidance and in line with mitigation measures to protect the environment. Topsoil on site will be stripped and stockpiled for reuse, soils handling to ensure soils are suitably stored and transported to maximise reuse. Soils subject to earthworks will be subjected to regular sampling and analysis for contamination. Exposed soil will be covered and seeded for vegetation as soon as possible and all disturbed areas to be reinstated with suitable soils to ensure future growth. The use of soil screening or other treatments should be used on site where it is possible to process

materials which would otherwise be classified as unacceptable into materials suitable for use in the project.

All materials exported from site to be in accordance with the Waste Management Act 1996 as amended. Any potential for use of surplus material within local sites shall be pursued at construction and detailed design stage (subject to compliance with Waste Management Acts).

Post mitigation impact significance for all identified adverse impacts has been determined as Not Significant.

9 Landscape and Visual

'Landscape' results from the interplay between the physical, natural and cultural components of our surroundings. Different combinations of these elements and their spatial distribution create distinctive character of landscape in different places. 'Landscape character assessment' is the method used in LVIA to describe landscape, and by which to understand the potential effects of a development on the landscape as 'a resource'. Character is not just about the physical elements and features that make up a landscape, but also embraces the aesthetic, perceptual and experiential aspects of landscape that make a place distinctive.

Views and 'visual amenity' refer to the interrelationship between people and the landscape. The GLVIA prescribes that effects on views and visual amenity should be assessed separately from landscape, although the two topics are inherently linked. Visual assessment is concerned with changes that arise in the composition of available views, the response of people to these changes and the overall effects on the area's visual amenity.

The assessment of landscape and visual effects included a desktop study, review of the proposed development drawings and visualisations, and site visit was carried out in July 2020 and May 2022.

The site's enhancement values (as set out in Section 9.3.4) identified that some aspects of the Ballyhale village can be improved in terms of landscape and visual amenity. These are; to screen existing developments that are uncharacteristic of the area; to enhance sections of the stream that are unkept; and improve the overall appearance of the river banks.

The site's conservation values (as set out in Section 9.3.4) predominantly reflect the core elements of the local architectural, heritage and landscape designations and the landscape resource.

The landscape sensitivity of the receiving environment / Ballyhale village is 'Medium'.

9.1 Construction Phase

The effects during construction would affect a small geographical extent of the village. The predicted landscape effects will be Moderate, adverse and temporary effect during the period of construction. The effect is localised to the village and areas in the vicinity of the works, and will not be evident in the wider landscape.

9.2 Operational Phase

The landscape effects are considered under the different character areas of the village. For each area, the Sensitivity, Magnitude of Change and Significance of Effect are listed below;

The 'Agricultural lands South of the village' area is of 'Medium' sensitivity and would experience 'low' magnitude of change resulting in Slight, neutral and permanent effect.

The 'Church and surrounds' area is of 'High' sensitivity and would experience 'low' magnitude of change resulting in Moderate-Slight, neutral and permanent effect.

The 'Main Street and north of the village' area is of 'Low' sensitivity and would experience 'low' magnitude of change resulting in Not-significant - Slight, neutral and permanent effect.

9.3 Visual Impacts and Effects

11 no. viewpoints were identified to carry out visual assessment.

9.3.1 Construction Phase

During construction phase, the significance of effects vary from 'Moderate – Very Significant'. Generally, all views experience an adverse visual effect which are 'Temporary - Early short term' effect lasting only during the construction phase.

9.3.2 Operational Phase

For each area, the Sensitivity, Magnitude of Change and Significance of Effect are listed below;

'Agricultural lands South of the village' area;

The magnitude of change is expected to be Medium from this area and the visual effects are likely to be Moderate-Slight. Initially, the quality of the change is assessed as 'neutral', but as overtime the proposed landscaping proposals and natural regeneration of the cut-back vegetation matures, the quality is expected to remain 'neutral' and or improve to 'Beneficial'.

'Church and surrounds' area;

The magnitude of change is expected to be Medium-High, majority being Medium in this area and the visual effects are likely to range from Slight to Significant. Initially, the quality of the change is assessed as 'Adverse', but as overtime the proposed landscaping proposals and natural regeneration of the cut-back vegetation matures, the quality is expected to improve to 'Neutral-Beneficial'.

'Main Street and north of the village' area;

The magnitude of change is expected to be Low-Medium, majority being Low in this area and the visual effects are likely to range from Slight to Moderate. The proposed changes are assessed as being 'Neutral'.

9.3.3 Summary

Given the nature of works i.e., improvements of flood defences, enhancement of existing character of the river and river banks and creation of a new pocket park, the overall impacts would be 'neutral -beneficial' to the village.

10 Cultural Heritage

10.1 Introduction

The Cultural Heritage of the area of the proposed project was examined through an Archaeological, Architectural, and Historical study. The Archaeological and Architectural studies involved a documentary/cartographic search and focussed field inspection of the area, while the Historical study involved a documentary search.

10.2 Archaeological Heritage

There are three sites of Archaeological Heritage interest/potential located within the defined Cultural Heritage Study Area; CH-1 (SMR No: KK031-034) includes four individual elements – Church, Graveyard, Font and Castle (unclassified); the latter is considered to be the tower of a medieval church; CH-2 (SMR No: KK031-070) is a Souterrain and CH-3 (SMR No: KK031-090) is a burnet mound. The Zones of Archaeological Potential/Notification (ZAP/ZAN) established for CH-1 & CH-2 are located within the extent of the development planning boundary.

In general, it is not considered likely that any direct or indirect (visual) impacts will occur to any identified monuments as a result of the development proceeding, as proposed.

It is considered that there is potential that human remains/graves might exist outside the existing western and northern boundary walls of the graveyard, as presently defined. Consequently, in order to ensure that any potential subsurface remains of archaeological interest are identified and recorded, a programme of archaeological testing will be undertaken in this area in advance of the commencement of works and following completion of the CPO Process. Furthermore, as a general precautionary measure, archaeological monitoring shall be undertaken with respect to the construction of the contractor's compound, berm/embankments, and new channel, the removal of existing Church Walkway and its replacement, creation of the public realm walkway and all associated construction access routes.

The watercourses within the overall defined Cultural Heritage Study Area comprise the Ballyhale River, including an associated channel which flows northwards outside the western boundary to the catholic church and graveyard; sections of both channels are positioned within the Zone of Archaeological Notification (ZAN) associated with CH-1. The watercourses are presently very overgrown and not accessible to survey; consequently, all clearance, deepening and bank regrading works in watercourses shall be subject to archaeological monitoring and all spoil shall be raked-over and subject to metal detecting.

10.3 Architectural Heritage

A total of eleven individual structures of Architectural Heritage interest have been identified; four of the structures are included in the Record of Protected Structures (RPS) of the Kilkenny County Development Plan 2011-2027 and nine are included in the non-statutory National Inventory of Architectural Heritage (NIAH); furthermore CH-1a (Church) and CH-1d (Castle [church tower]) are also included in the Archaeological Inventory, as well as the RPS, with CH-1a and CH-4 (House) also included in both the RPS and NIAH listings. Aside from Ballyhale Bridge (CH-10), none of these structures have the ability to be directly or indirectly (visually) impacted by any elements of the proposed project works due to their respective locations with regard to the various elements of the development.

It is proposed to realign the river channel adjacent Ballyhale Bridge (CH-10) and improve the inlet conditions (G-002) and install a pool and boulder pass upstream (G-004). In addition, a new overflow culvert (P-002), with a flow control structure/overflow weir at its western terminal, will be constructed to the immediate north of the existing northern arch of the bridge; this will entail removal of part of the west-facing wall façade and parapet to the bridge, which will then be reinstated and extended using a mixture of the existing/original stone and new matching stone. A detailed methodology for such works will be prepared by a conservation engineer for agreement with the Kilkenny County Council Conservation Officer.

11 Population and Human Health

11.1 Introduction

The assessment of potential impacts on Population and Human Health is contained within Chapter 11 of the EIAR. It also details the proposed mitigation measures where necessary. The 2014 EIA Directive (2014/52/EU) updated the list of topics to be addressed in an EIAR and replaced 'Human Beings' with 'Population and Human Health'. This chapter also meets the requirement for assessment of 'Human Beings', as set out in Schedule 6 of the Planning and Development Regulations 2000 (as amended).

11.2 Existing Environment

11.2.1 Site Location and Description

The proposed site is within the settlement of Ballyhale, Co. Kilkenny. The subject site is c. 7.5km to the southwest of Thomastown and 2.2km to the east of the M9 motorway. The R448 is the principal road through the town and the Dublin-Waterford railway line runs to the west of the village.

The town is within the catchment of the Little Arrigle River which is a tributary of the River Nore. The main channel of the river runs to the west of the village and the Ballyhale River, a tributary of the Little Arrigle runs through the village and discharges to the River Nore and River Barrow SAC to the north of Ballyhale Town. The site is located in close proximity to a range of recreational, commercial and residential facilities, including Ballyhale GAA Club, Kiltorcan Business Park and Ballyhale Health Centre.

11.2.2 Population

Ballyhale settlement is located within the Electoral District of Ballyhale and is subject to the Kilkenny City and County Development Plan (KCiCDP) 2021. It is identified as one of 22 rural towns in the settlement hierarchy (Section 4.3 of the KCiCDP). The Census 2016 identifies Knocktopher hosting a population of 521, Ballyhale ED with a total of 424 and the Kiltorcan ED with a population of 175. The percentage change between 2011 and 2016 is located within Table 11.1 of the Population and Human Health Chapter which outlines an increase in population which is higher than both the state and county averages.

Ballyhale is one of the smallest rural towns identified in the settlement hierarchy for Kilkenny County, accounting for 0.18% of the total population of the rural settlements and the population of the settlement of Ballyhale is set to grow by 14 to 188 (0.08%) by 2027.

11.3 Impact Assessment

In identifying potential impacts and receptors, consideration was given to the proposed relief works and the identified receiving environment. The proposed relief works are set to take place in a rural settlement, with a range of services, businesses and community facilities which may experience a temporary disruption. Therefore, local residents may be affected who are in use or within close proximity of the settlement. The following list outlines the potential receptors:

- Local Residents
- Community Facilities and Services
- Economic Activities
- Temporary Receptors

11.3.1 *Do Nothing Scenario*

If the flood relief scheme does not proceed there will be no construction related impacts on the receptors identified above. The settlement of Ballyhale would remain at risk of flooding. The risk is quantified in the Hydraulic Report prepared for the scheme by McCloy Consulting Engineering. The results of the report showed substantial flood risk within Ballyhale Village originating from the Ballyhale River. The primary issue is the incapacity of the channel along the Ballyhale River.

The Do-Nothing Scenario would result in a long-term adverse effect on the settlement of Ballyhale.

11.3.2 *Construction Stage Impacts*

Chapter 5 outlines the works associated with the proposed development. The nature of the works is discrete and is likely that individual access will be required to each area.

Construction activities may cause emissions to air and/or surface water as well as increased noise and vibration. The construction phase of the project will commence in 2024 and take place over a 20-month period depending on phasing of the construction.

The works are intended to be spread out over several locations within Ballyhale, therefore traffic disruptions can be anticipated (outlined in Chapter 15 – Traffic). The assessment identified that construction of the proposed scheme will cause temporary short-term impacts on the local road network, these are expected to be minimised through enforcement of a Construction Management Plan. This will take residential and commercial developments in the area into account.

Potential impacts and effects with regard to Construction Noise and Vibration and Air Quality/Climate are described in detail in Chapter 13 (Noise and Vibration) and Chapter 12 (Air Quality). Potential impacts on surface water and water courses are considered in Chapter 7 (Water Environment).

No significant impacts on population and settlement patterns as a result of the construction phase of the project are anticipated. Any impacts on local business and economic activity will be negative, but temporary and moderate for the duration of the particular phase of construction works.

Once mitigation measures are put in place the potential for fugitive dust emission effects at the nearest residential properties will be controlled to ensure any impacts are of no significance.

Noise from construction works will fluctuate throughout the course of a typical working day as well as over the course of the construction works being undertaken in any one location. There will be no significant vibration impact during the construction of the proposed Ballyhale Flood Relief Scheme as there is no proposal for piling to occur during construction.

11.3.3 Operational Stage

Once completed, the flood relief works are likely to have a positive impact on the settlement of Ballyhale. It is likely to attract more development and increase the population of the settlement site and surrounding area.

No operational impacts are anticipated as a result of traffic, noise and vibration, or air and climate. The impact of the flood relief works is anticipated to be positive, significant and long term.

11.4 Mitigation Measures

Mitigation measures in relation to population and human health are set out in the relevant chapters of the EIAR. No further mitigation measures are proposed.

11.5 Cumulative Impacts

There will be no operational impacts as there is no traffic associated with the operational phase of the development.

No significant cumulative impacts are anticipated.

11.6 Residual Impacts

None identified, following implementation of proposed mitigation measures for population and human health.

11.7 Significant Interactions

No significant interactions with population and human health have been identified. Potential interactions between other disciplines are assessed in the relevant chapters of this EIAR.

12 Air Quality

The background air quality in the area of the development is of good quality and the site is located in 'Zone D' as denoted by the EPA.

During the 'Construction Phase' there will be the potential for an air quality and dust impact due to the nature of the proposed construction activities.

As prescribed within Environmental Protection UK and the Institute of Air Quality Management, Land-use Planning & Development Control: Planning For Air Quality (January 2017) the proposed Ballyhale Flood Relief Scheme has been assessed in accordance to the "Guidance on the assessment of dust from demolition and construction" (Version 1.1), published by The Institute of Air Quality Management in February 2014. This guidance has been referenced to assess the potential impact of the vehicle movements and the earthworks phase of the proposed works.

Approximately 23 sensitive receptors have been noted within 20m of the proposed construction works. The closest works to a designated ecological site are the proposed fish passage works which are approximately 17m from the River Barrow and River Nore SAC boundary. Using the IAQM methodology for the assessment of impacts from construction activities, the following is indicated in Table 1-9;

- the risk of dust soiling impacts are medium for demolition and are low for earthworks, construction and for trackout;
- the impacts on human health are negligible for demolition, earthworks and construction and are low for trackout; and
- the ecological impacts are high for trackout, medium for demolition and are low for earthworks and construction.
- In accordance with the IAQM Guidance, the highest risk category measures have been applied in the determination of appropriate mitigation measures.

Together with the proposed mitigation measures and the existing low background particulate (PM10) concentrations, the construction phase activities on the proposed site will not cause an exceedance of the air quality objectives at receptor locations. There will be no impact on local air quality during the operational phase of the proposed development.

13 Noise and Vibration

The Noise & Vibration Impact Assessment has addressed the noise and vibration impact of the Ballyhale Flood Relief Scheme, Ballyhale, Co. Kilkenny during the Construction and Operational Phases on the nearest residential properties.

The assessment and evaluation of the potential noise and vibration impact arising from the proposed flood relief scheme involved the following:

- Baseline Noise Survey – noise monitoring survey representative of the daytime period to determine the existing noise climate in proximity to the residential receivers in the vicinity of the proposed flood relief scheme in accordance with ISO 1996: 2016.
- Identification and assessment of potential noise and vibration sources from the construction of the proposed flood relief scheme.
- Construction noise impact prediction using the methodology outlined in BS 5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise.
- An assessment of the predicted noise levels and the noise impact on the nearest residential receivers against relevant guidelines and standards.
- A recommendation of appropriate construction and operational noise and vibration mitigation measures.

Based on the expected short-term duration of works at each location there will be a short-term noise impact at the nearest sensitive receivers to the proposed works. In some of the works areas, the predicted worst-case 1-hour construction noise levels may briefly be in excess of the recommended maximum noise level of 70 dB LAeq / 80 dB LAMax at 1m from the façade of the nearest residential properties as outlined by the TII Guidelines (March 2014). Noise from construction works will fluctuate throughout the course of a typical working day as well as over the course of the construction works being undertaken in any one location. Therefore, the daytime construction noise limit of 65 dB LAeq,12 Hour should be achieved at the nearest residential properties. The construction noise impacts will be short-term and will not be significant.

Appropriate mitigation measures have been identified to ensure the Construction Phase target noise limits are not exceeded. There will be no noise and vibration impact during the operational phase of the proposed development.

14 Material Assets

14.1 Utilities

This section deals with the material assets in the form of utilities that could potentially be impacted by the Proposed Scheme. This section assesses the impacts of the proposed utilities on the existing utility network in the areas, which includes the following;

- Electricity;
- Water;
- Drainage;
- Gas; and
- Telecommunications (including broadband and TV).

Predicted Impacts from this study include the requirement for local diversions, temporary outages and an increase in use of existing utilities.

To minimise the impact on the existing material assets (utilities), a number of mitigation measures will be put in place including;

- the Contractor will be obliged to put measures in place during the construction phase to ensure that there are no interruptions to existing services and all services and utilities are maintained unless this has been agreed in advance with the relevant service provider and local authority.
- All works in the vicinity of utilities infrastructure will be carried out in ongoing consultation with the relevant utility company and/or local authority and will be in compliance with any requirements or guidelines they may have. All relevant utility providers will be contacted and offered the opportunity to incorporate new strategic infrastructure in the new road construction. (The majority of major providers have already been notified of the proposed scheme.)
- Where new services are required, the Contractor will apply to the relevant utility company for a connection permit where appropriate and will adhere to their requirements.
- No mitigation measures will be required during the operation stage due to measures incorporated in the design.

14.2 Land Use

This section describes the potential impacts of the proposed Flood Relief Scheme on land use at, and adjacent to, the proposed scheme footprint. This section describes the material assets of human origin that could be impacted upon. Land-use also considers if there will be

severance, loss of rights of way or amenities, conflicts, or other changes likely to ultimately alter the character and use of the surrounding area.

The following general mitigation measures are proposed for the proposed development;

- Access shall be maintained to all affected property (both construction and operational phase). Locations will be agreed with relevant landowner's subject to engineering constraints;
- Where part of the curtilage of a property is to be permanently acquired, the acquiring authority will hold discussions with the property owner and generally agree to replace boundaries on a like for like basis, subject to engineering and planning constraints, or it will be treated as a compensation issue;
- Prior to construction and subject to written agreement of the relevant property owners, property condition surveys will be undertaken in relation to all buildings/structures in the direct vicinity of the proposed works.
- Any services that are interfered with as a result of the proposed flood defence scheme will be repaired/replaced without unreasonable delay.

A moderate inconvenience to land owners and home owners on access and movement within the local area will be experienced as a result of the establishment and ongoing use of the construction site. However, the mitigation measures outlined in this chapter and complementary chapters will generally maintain access arrangements and ensure no significant negative effects arise.

14.3 Summary

Implementation of the measures outlined in this chapter and supporting chapters will ensure that the proposed development does not result in any significant adverse effects on material assets.

The proposed Scheme will provide protection up to the 1% AEP flood event. This will result in a significant long-term positive impact due to the reduction in flood damages.

15 Traffic & Transport

15.1 Introduction

This section of the Environmental Impact Assessment Report (EIAR) document has been prepared by DBFL Consulting Engineers and addresses all transport and related sustainability issues including means of vehicular access, pedestrian, cyclist and local public transport connections. The principal objective of this chapter is to quantify any level of impact across the local road network and subsequently ascertain the operational performance of the local road network.

The Flood Relief Scheme consists of a range of interventions along the watercourse reach in Ballyhale, a village located in the south of County Kilkenny, within approximately 25 km south of Kilkenny City, halfway between Kilkenny and Waterford city.

The Traffic and Transport EIAR chapter describes the predicted impact of the proposed development during the construction and operational phases and incorporates a range of integrated control measures for mitigating this impact during both phases.

15.2 Construction Phase

For the construction phase, a Construction Management Plan (CEMP) has been produced and details how the project is to be executed in accordance with all project, statutory and environmental requirements. The EIAR chapter incorporates a range of integrated control measures and associated management initiatives with the objective of mitigating the impact of the proposed developments on-site construction activities.

A site compound location and haul routes have been identified and agreed with the local authority. It is an area proximate to the works from which safe access to the surrounding road network can be provided.

On-site employees will generally arrive before 07:00, thus avoiding the morning peak hour traffic. These employees will generally depart after 17:00. Deliveries will be actively controlled and subsequently arrive at a dispersed rate during the course of the working day.

An appropriate control and routing strategy for HGVs will be implemented for the duration of site works. In relation to trip generation, it is not expected HGV vehicle movements to exceed 4 vehicles per hour during the busiest period of construction works based on the material quantities presented. HGVs will be directed to the site compound via the R448 and shall not be permitted to use local routes such as Chapel Lane except for essential deliveries on these routes.

Considering the site's proximity to the strategic road network, the low number of HGVs and following the implementation of an appropriately detailed CTMP, it is concluded that construction traffic will not give rise to any significant traffic concerns or impede the operational performance of the local road network and its surrounding junctions.

Enforcement of a range of integrated control measures and associated management initiatives will ensure that construction traffic impacts are minimised through the control of site access / egress routes and site access locations and any necessary temporary lane closure requirements. These includes;

- All road works will be adequately signposted and enclosed to ensure the safety of all road users and construction personnel.
- Scheduling of movements to outside peak traffic times and school pick-up / drop-off times.
- Wheel-wash facilities will be provided whenever vehicles exit the sites and the site compound, entering back onto the public road network.
- Dedicated road sweeper will be put in place and will be located in the site compound. It will sweep the haul routes via public roads.

15.3 Summary

Traffic volumes to and from the proposed scheme during the operational phase (i.e. maintenance vehicles) are expected to have negligible impact on the surrounding road network and that any residual effects will be short term and not significant.

16 Interactions

In addition to the assessment of impacts on individual topics presented in the previous chapters of this EIAR, the interaction between these factors has also been considered as part of the environmental impact assessment.

This chapter analyses the Interrelationships and cumulative effects and main interactions between different aspects of the environment likely to be significantly affected by the proposed project. The first type is the assessment of effects on receptors or receptor groups, such as local residents, which may be affected by different environmental elements generated by the proposed flood relief scheme simultaneously or concurrently. This is sometimes referred to as the 'interrelationships' or 'in combination effects' between different environmental effects. The assessment includes consideration of particular locations/receptors where several effects for example noise, air and landscape may all occur.

The second type is the assessment of effects of the proposed project together with other past, present or reasonably foreseeable projects, where there is potential for overlap spatially or temporally, often referred to as cumulative effects.

The potential for significant interactions, cumulative impact and indirect impacts was examined at the screening stage in the preparation of the EIAR. Where the potential for significant interactions or impact was identified, such interactions and impacts were included in the scope and addressed in the baseline and impact assessment chapter for each of the relevant environment chapters namely Chapters 6 to 15 inclusive.

The matrix and expert opinion approaches, as described and outlined in the aforementioned EU Guidelines were used in the identification of the potential for significant interactions, cumulative impacts, direct and indirect impacts.

All environmental factors are inter-related to some extent, and the relationships can range from tenuous to highly complex. The major interactions between the recorded environmental impacts are assessed within the individual chapters of the EIAR. Table 16-1 provides a matrix summarising the key inter-relationships between the various parameters outlined in this EIAR from Chapters 6 to 15, inclusive.

The matrix highlights the potential for the topic or issue in the left-hand column to have an effect on the environmental issue mentioned in the top row of the matrix. If there is a "✓" in a box this means that there is potential for an effect during the operational or construction phase of the proposed project. If there is considered to be no potential for an effect, the box will be left blank. These interactions have been considered in and assessed in the Environmental Impact Assessment.

Table 16-1: Matrix to Summarize Key Inter-relationships

Key Environmental Interaction Matrix	Biodiversity	Water Environment	Land and Soils	Landscape and Visual	Cultural Heritage	Population and Human Health	Air Quality	Noise and Vibration	Material Assets	Traffic and Transport
Biodiversity		✓	✓	✓						
Water Environment	✓		✓			✓				
Land and Soils	✓	✓					✓	✓		✓
Landscape and Visual	✓				✓				✓	
Cultural Heritage				✓						
Population and Human Health		✓					✓	✓	✓	✓
Air Quality			✓			✓				✓
Noise and Vibration			✓			✓				✓
Material Assets				✓		✓				✓
Traffic and Transport			✓			✓	✓	✓	✓	

