

Project

Ballyhale Flood Relief Scheme, Ballyhale, Co. Kilkenny

Report Title

Environmental Constraints Report

Clients

OPW

Kilkenny County Council

INFRASTRUCTURE



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August 2021



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1 Introduction

1.1 Project Background

DBFL Consulting Engineers have been appointed by Kilkenny County Council (KCC) to advance and implement a flood relief scheme for 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.

1.2 Scope of Constraints Study

This constraints assessment forms part of Stage 1 of the scheme development. This builds on the original CFRAM assessment which identified a need for the scheme.

The constraints report is the first step in the Environmental Impact Assessment (EIA) for the scheme. The purpose of the Constraints Study is to determine what environmental constraints exist that could affect the design of the scheme, could affect the scheme timelines either during planning or subsequent stages or could influence the cost of the scheme.

Environmental constraints have been investigated under the following environmental topics which generally follows the Environmental Protection Agency's Guidelines 'Advice Notes on the Current Practice in the Preparation of Environmental Impact Statements:

- Water Environment
- Biodiversity
- Cultural Heritage
- Landscape and Visual
- Soil Geology and Hydrology
- Air and Noise
- Land & Soils

The constraints report will determine relevant environmental sensitivities in the study area. The sensitivities of environmental receptors affected will then be used to inform the environmental scoring under a multi criteria analysis which will be used to determine a preferred option to be taken forward for regulatory approval. An overview of the overall Scheme process is presented in Figure 1-1.

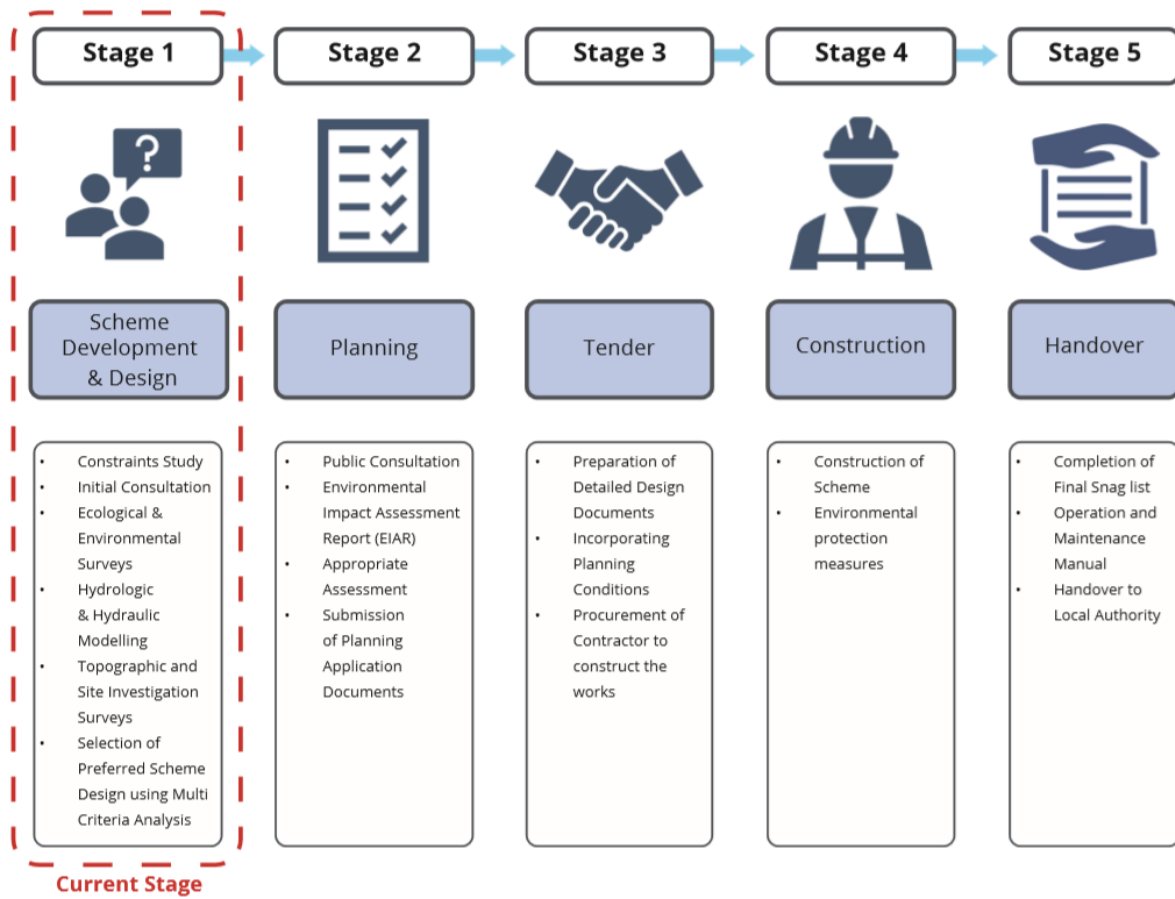


Figure 1-1: Scheme Stage Overview

1.3 Supporting Assessments

The constraints report is part of a suite of documents which will be produced as part of the scheme development. The findings of the constraints report will feed into subsequent assessments. Key complementary assessments which will be carried out are outlined below. It is noted that the exact contents of reports may be amended as the scheme progresses.

Assessment	Topics to be Considered
Multi Criteria Analysis of Scheme Options	<ul style="list-style-type: none"> • Social <ul style="list-style-type: none"> a. Risk to human health and life b. Risk to community • Economic <ul style="list-style-type: none"> a. Reduce economic damages b. Risk to transport infrastructure c. Risk to utility infrastructure d. Risk to agriculture • Environmental <ul style="list-style-type: none"> a. Support WFD objectives b. Support the objectives of the Habitats and Birds Directives c. Avoid damage to, and where possible enhance, the flora and fauna of the catchment d. Protect and where possible enhance fisheries resource within the catchment e. Protect, and where possible enhance, landscape character and visual amenity within the zone of influence. f. Avoid damage to or loss of features, institutions and collections of cultural heritage importance • Technical <ul style="list-style-type: none"> a. Ensure flood risk management options are operationally robust b. Minimise health and safety risk in construction, maintenance and operation of the flood risk management option c. Ensure flood risk can be managed effectively and sustainably into the future, and the potential impacts of climate change
Environmental Impact Assessment Report (EIAR) / Environmental Report	<ul style="list-style-type: none"> • Route Options Considered • Consultations • Description • Planning and Policy • Biodiversity • Water Environment • Archaeological, Architectural and Cultural Heritage • Landscape and Visual • Air and Noise • Land and Soils • Material Assets - Land use • Material Assets - Utilities • Waste Management • Population and Human Health • Interrelationships, Interactions and Cumulative and Indirect Effects

2 Flood Risk Background

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 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.

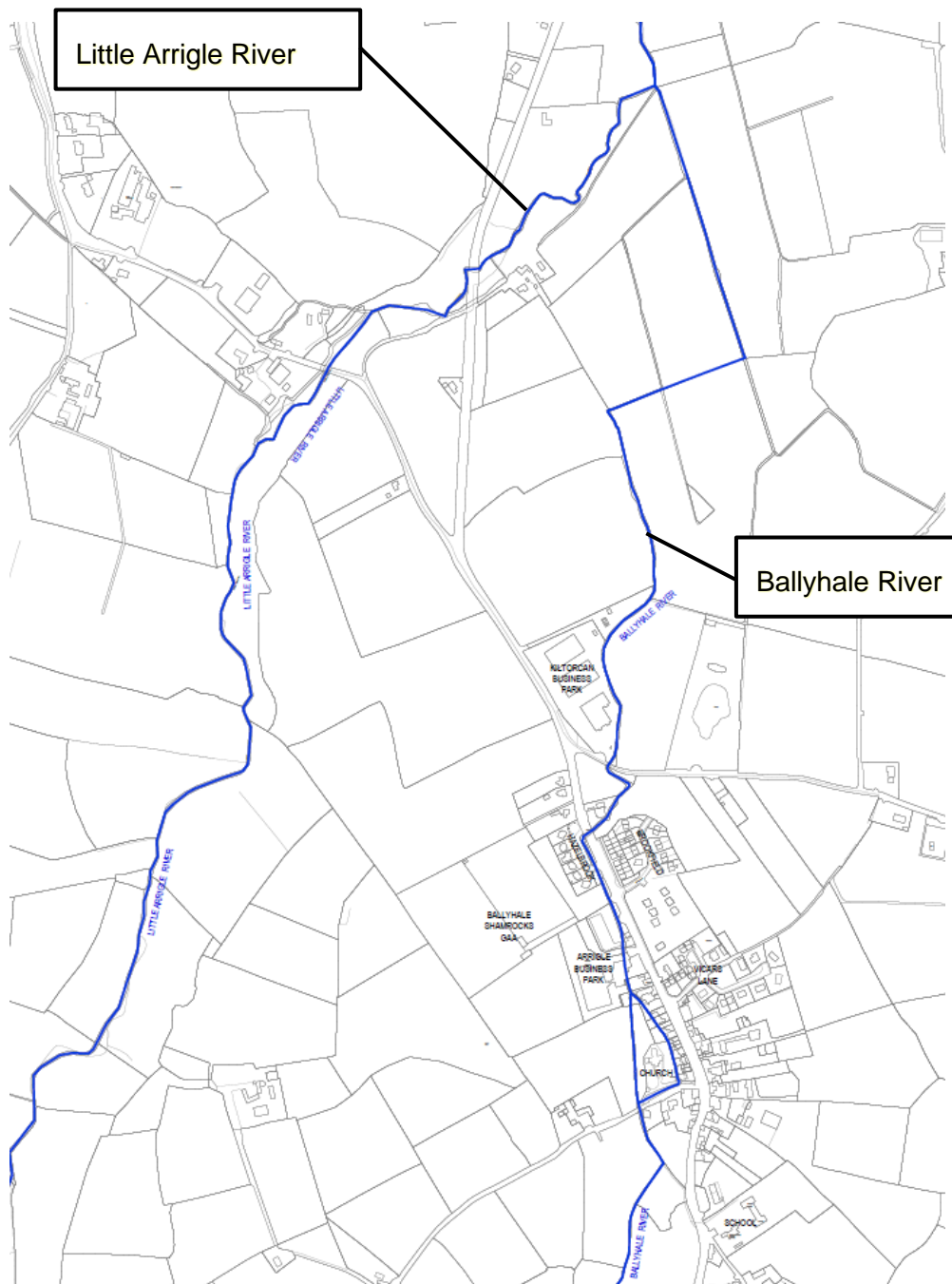


Figure 2-1 – Local Watercourses

The South Eastern CFRAM Study Flood Risk Review report (IBE0601Rp0001_Flood Risk Review_F01) identified Ballyhale as an Area for Further Assessment (AFA).

Historical flood records from floodinfo.ie notes KCC records of recurring flooding in Ballyhale and notes records of flooding affecting Ballyhale in November 2000 & November 2002

The South Eastern CFRAM carried out a study of flooding in Ballyhale which included hydraulic modelling. The study predicted that out of bank overland flooding occurs upstream of the village on the eastern bank of the Ballyhale River. These floodwaters flow overland across agricultural lands and into the village. Flooding is also affected by a number of undersized culvert/bridge structures on the watercourse through the village. The study estimated that 25 properties in Ballyhale are at risk of flooding for the current day 1% Annual Exceedance Probability (AEP) event. An extract from the CFRAM flood mapping is presented in Figure 2-2.

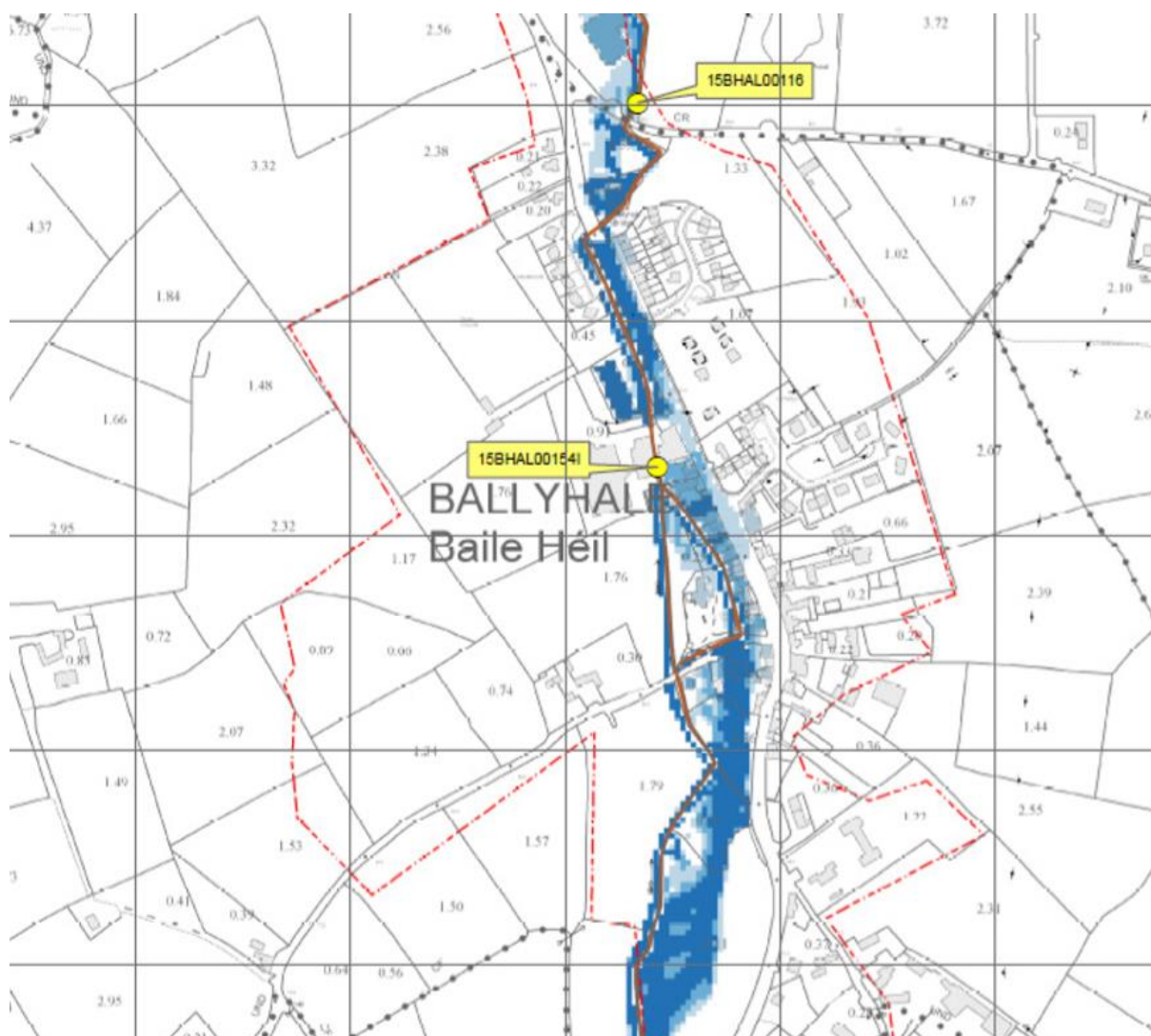


Figure 2-2: Fluvial Flood Extents 1% AEP
(Source - CFRAM O15BAE_EXFCD_F0_01)

The CFRAM also identified a potential flood relief option. This option was a combination of an embankment and flow diversion from the Ballyhale River to the Little Arrigle River. The CFRAM option is to be assessed further and developed / amended as part of the current project level assessment.

3 Study Area

In order to properly assess constraints and define detailed study areas for the various disciplines, an idea of what works the scheme may entail are required. Therefore a high level selection of concept works which may be implemented have been developed. These solutions have been developed in advance of hydraulic modelling and baseline assessment. Therefore they are likely be modified and to be supplemented with additional options as the scheme progresses. Concept study areas for this constraints assessment stage are presented below.

As outlined in Section 1.3 above, a number of supporting assessments will be carried out which will investigate the viability of all flood relief options and methodologies and provide a Multi Criteria Assessment of the eventual flood relief options/routes which are deemed viable.

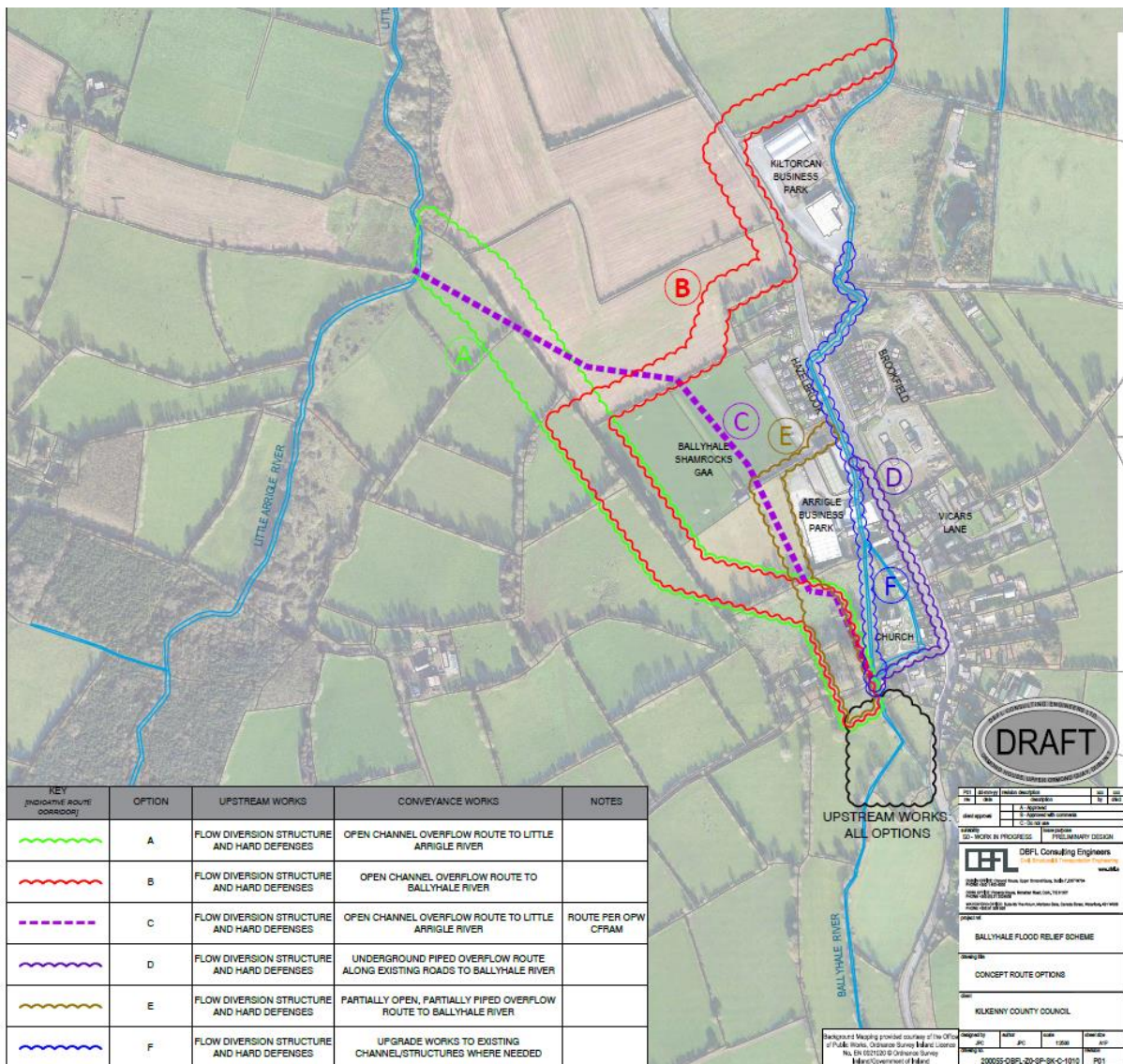


Figure 3-1: Study Area – Constraints Assessment

4 Consultations

A range of consultations have been carried out to seek input to the developing scheme and identify items to consider within environmental assessments. Consultations included

- Non statutory consultation via Kilkenny County Council consultation portal (<https://consult.kilkenny.ie/en/consultation/ballyhale-flood-relief-scheme-public-consultation-no-1>). This provided brochure information, links scheme information and provided means to provide input via consultation portal and details to directly contact KCC project staff
- On online survey was made available and linked from the consultation portal allowing general feedback and seeking targeted responses on a range of environmental topics
- Advertisements on consultation stage via Kilkenny County Council social media channels and local newspapers
- Consultation with various internal KCC departments
- Consultation with local maintenance staff on site to determine flood history and other items of relevance
- Consultation with public and landowners during site walkovers
- Letter drop to local area and landowners alerting them of scheme and ongoing surveys

Consultation with a range of relevant statutory and non statutory bodies will carried out and emerging scheme information will be provided.

Additional public consultation stages will be arranged on selection of a preferred option.

5 Summary of Assessments

A summary of assessments completed is presented in the table below

Table 5-1: Summary of Constraints Assessments carried out

Discipline	Company & Author
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>
Biodiversity	Altamar Marine & Environmental Consultancy <i>Brian Deegan</i> <i>MCIEEM, M.Sc, BSc</i>
Cultural Heritage	Byrne Mullins Associates <i>Martin Byrne</i> <i>BA MA Dip. EIA Mgmt MIAI</i>
Landscape & Visual	Cunnane Stratton Reynolds <i>Evelyn Sikora</i> <i>BA MA MILI</i>
Air & Noise	Aona Environmental <i>Mervyn Keegan</i> <i>BSc, M.Sc, MIEMA</i>
Bat Survey (Biodiversity)	Bat Eco Services <i>Dr Tina Aughney</i> <i>PhD, B.Sc, MIEMA</i>
Arborist Survey	Darwin Tree Specialists Ltd <i>John Morgan</i> <i>BSc (Hons) Tech Cert (Arbor A)</i>
Site Investigations	IGSL – Ground Investigations & Geotechnical Specialists

Detailed reporting for each discipline is presented in the subsequent appendices.

A high level summary of constraints reports findings is presented in the table below

Table 5-2: Summary of Constraints Assessments carried out

Discipline	Constraints Summary
Water Environment	<ul style="list-style-type: none"> • Watercourses present in the study area consist of The Little Arrigle River, & The Ballyhale River (which includes a split channel section at Ballyhale Church). All are tributaries of the River Nore • The River Barrow and River Nore SAC begins close to the downstream extent of works and is considered sensitive to potential hydrological impacts on water quality/quantity from the scheme. <u>Therefore scheme will need to ensure impacts on surface water quality/quantity are avoided</u> • The bedrock Aquifer is a Regionally Important sandstone aquifer • 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
Land & Soils	<ul style="list-style-type: none"> • The Ballyhale Flood Relief Scheme is underlain in its majority by Kiltorcan Formation. The Kiltorcan Formation generally consists of yellow and red sandstone and green mudstone • 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. Bedrock is anticipated to be shallowest at the southern extent of the study area • GSI Quaternary sediment mapping indicates the majority of the scheme to be underlain by till derived from limestones and alluvium along some stream channels • No evidence of contaminated ground, mines, quarries or waste facilities have been identified within the concept route corridors • No Geological Heritage Sites are within the proposed scheme extents
Biodiversity	<ul style="list-style-type: none"> • The proposed works are proximate to and potentially within designated sites including Natura 2000 sites of international importance. The primary designated site proximate to/within or downstream of the proposed works is the River Barrow and River Nore SAC and there is a direct hydrological connection to this SAC. In addition the River Nore SPA is 5km downstream of all instream works • Several derelict/inhabited buildings are present on site and have bat roosting potential. A bat survey is recommended • As the start of several of the diversion options there is a large group of trees. The potential impact on this area should be minimised and an arborist included within the team to provide input into the retention of these trees • Based on the provisional site assessments many of the potential biodiversity issues noted on site can be mitigated and would not impact on the proposed development of the site. • <u>A Natura Impact Statement will be required as all options have a direct pathway to Natura 2000 sites</u> • For much of its length through Ballyhale the stream is highly modified and channelled. There are few pools, or areas of sanctuary for brown trout or juvenile salmon within the village or within the upstream section. Numerous sections of the stream are bridged and culverted through the town. These include several level changes within the watercourse would obstruct migrating and non migrating fish within the watercourse. In the upstream section of the stream the stream is silted with some locally impacted areas with “sewage

	<p>fungus” on the instream rocks. Organic-rich sediment line the banksides in the upstream areas. Of particular importance is the improvement of the habitat observed just downstream of Ballyhale where water quality and habitat appeared to improve significantly.</p>
<p>Biodiversity (Bats)</p>	<ul style="list-style-type: none"> • The following bat species were recorded during this bat survey: common pipistrelle, soprano pipistrelle, Leisler’s bat, Daubenton’s bat, brown long-eared bat and Natterer’s bat. This represents six of the nine resident bat species known to Ireland • The flood relief route options were assessed in relation to potential impact on local bat populations. Due to the fact that the majority of bat activity was recorded west and north of the village of Ballyhale, any route options that involve loss of treelines and hedgerows will impact on local bat populations due to the removal of commuting routes and foraging habitat.
<p>Cultural Heritage</p>	<ul style="list-style-type: none"> • A number of sites of archaeological importance are present in the vicinity of Ballyhale church including the church, castle the graveyard and a font. All are listed within the Kilkenny County Development plan and most are listed in the Record of Monuments and Places (RMP) • Additional sites of archaeological importance from the RMP are identified west of the watercourse upstream of the village and include a souterrain and a burnt mound • Site of Architectural heritage are listed within the National Inventory of Architectural Heritage (NIAH) • NIAH sites in the vicinity of the works include the Church tower, a number of buildings on main street, a water pump on main street • Two existing bridges on the Ballyhale River are also on the NIAH
<p>Landscape & Visual</p>	<ul style="list-style-type: none"> • A number of county development plan aims relate to protection of existing woodlands, trees and hedgerows • The landscape character of this area is defined by a smooth terrain, allowing views over long distances, and vegetation is predominantly low. Land use comprises pasturelands and tree plantations, the area is described as a rural area with scattered, low density settlement patterns • The area in the vicinity of the Church and to the south has a strong historic character with several key landscape and townscape features, which include mature trees, the historic church tower, stone walls, bridges and steps, and the stream • <u>Elements which are considered to contribute to the character of the area and should be retained include the mature trees, the stream channel, the stone walls and bridges and Pairc na Seamróg</u> • The Kilkenny Landscape Character Assessment notes that this landscape unit is perceived as having no special landscape or scenic value. • Trees in Ballyhale are not included on the Tree Register of Ireland or under Tree Preservation Orders
<p>Air & Noise</p>	<ul style="list-style-type: none"> • The Air Quality Index for Health indicates that the air quality in Ballyhale is ‘Good’. • Ballyhale is not included within the Kilkenny Noise action plan as it is located along the regional road R448 and the noise maps produced do not cover this area as there is less than 3 million vehicles per year on the R448 • Receptors sensitive to noise and air impacts are primarily located along the main street. • No operational impacts on noise and air are anticipated however construction stage activities may cause short term impacts

<p>Arborist Survey</p>	<ul style="list-style-type: none"> • The vast majority of the tree cover within the survey area was located within established traditional agricultural field boundary hedges or linear tree groups (of a similar species mix) running alongside the banks of the watercourse or alongside drainage ditches. • Tree group and hedge condition was variable, with most of the understorey species being in reasonable health, however, many of the Ash trees are showing signs of significant crown dieback associated with infection by the fungal disease commonly known as Ash Dieback disease (ADB). The disease is widespread across the survey area and was seen to be affecting both younger and older trees. • There are several small clusters of young trees and bushes along the exposed sections of stream through the centre of the village, these are mostly of relatively small size and value/quality and were graded category C (low value). • Significant construction activity should be avoided within the root protection areas (RPAs) of trees intended for long-term retention.
<p>Site Investigations</p>	<ul style="list-style-type: none"> • A high degree of consistency was noted in the general stratification. Topsoil (with a little fill in places) generally overlies firm to stiff very gravelly CLAY. • In some locations a thin SAND/Gravel layer is noted between the upper topsoil and the gravelly CLAY. • Trial pits were terminated at relatively shallow depths (between 1.00 and 2.00 metres) in eight of the ten locations. • Tests on the cohesive gravelly SILT/CLAY confirm that the material ranges from silt to clay dominant, falling partly into Class CI/CL of the standard classification and partly into the non-plastic fraction. Results are indicative of sensitive soil of low plasticity. Moisture contents of 8 to 24% were recorded. • The grading curve reflects some variation from gravelly silt Clay to more granular clay-bound sandy GRAVEL. A sample from the gravel stratum in TP02 is clean and well graded in the sand to coarse gravel range. • A sulphate design class of DS-1 (ACEC Classification for Concrete is indicated for sulphate concentrations lower than 0.5g/l. No special precautions are therefore deemed necessary for protection of below ground concrete. • All samples testes are confirm to be classified as INERT in accordance with the Landfill Waste Acceptance Criteria (WAC). Material excavated during construction may be disposed of within the site or off site to a suitably licensed landfill facility. • No traces of Asbestos were determined during routine testing.

Appendices

Appendix 1 – Study Area Context Map

Appendix 2 – CFRAM Flood Map

Appendix 3 – Air & Noise

Appendix 4 – Water Environment

Appendix 5 – Land & Soils

Appendix 6 – Biodiversity

Appendix 7 – Cultural Heritage

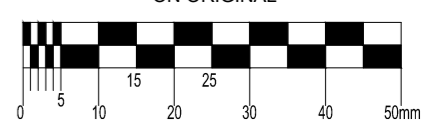
Appendix 8 – Landscape & Visual

Appendix 9 – Bat Survey

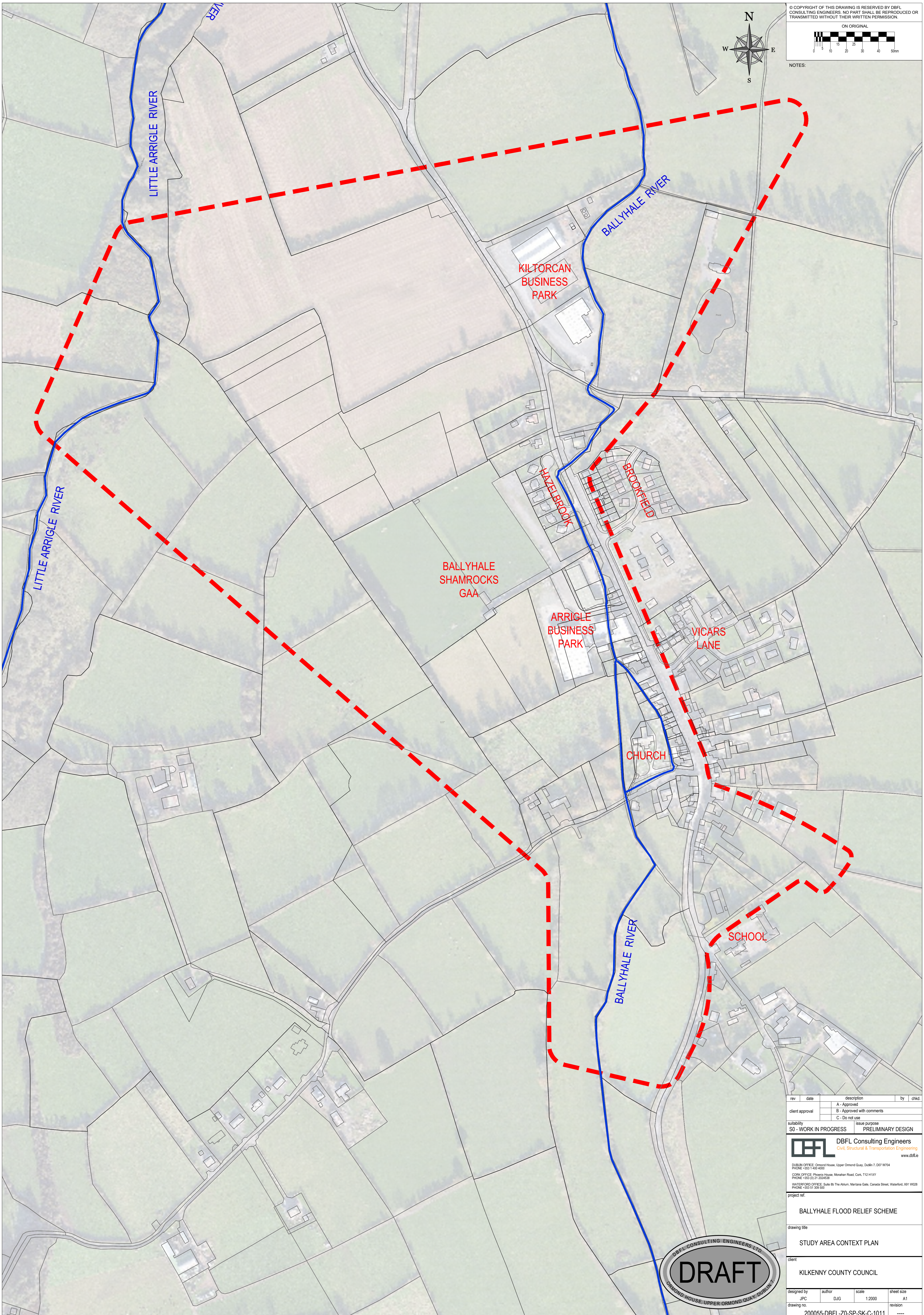
Appendix 10 – Arborist Survey

Appendix 11 – Site Investigations Report

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NOTES:

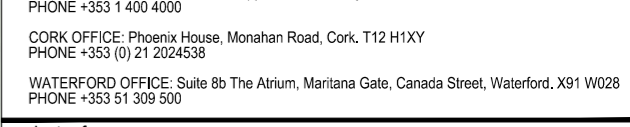


rev	date	description	by	chkd.
		A - Approved		
		B - Approved with comments		
		C - Do not use		

client approval

SO - WORK IN PROGRESS

issue purpose PRELIMINARY DESIGN



project ref.

BALLYHALE FLOOD RELIEF SCHEME

drawing title

STUDY AREA CONTEXT PLAN

client

KILKENNY COUNTY COUNCIL

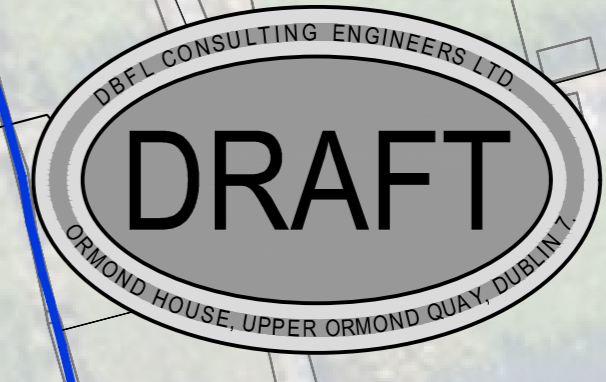
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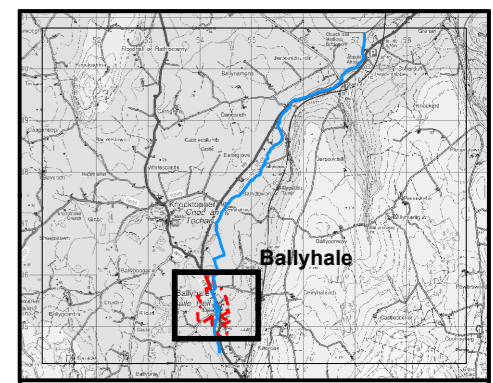
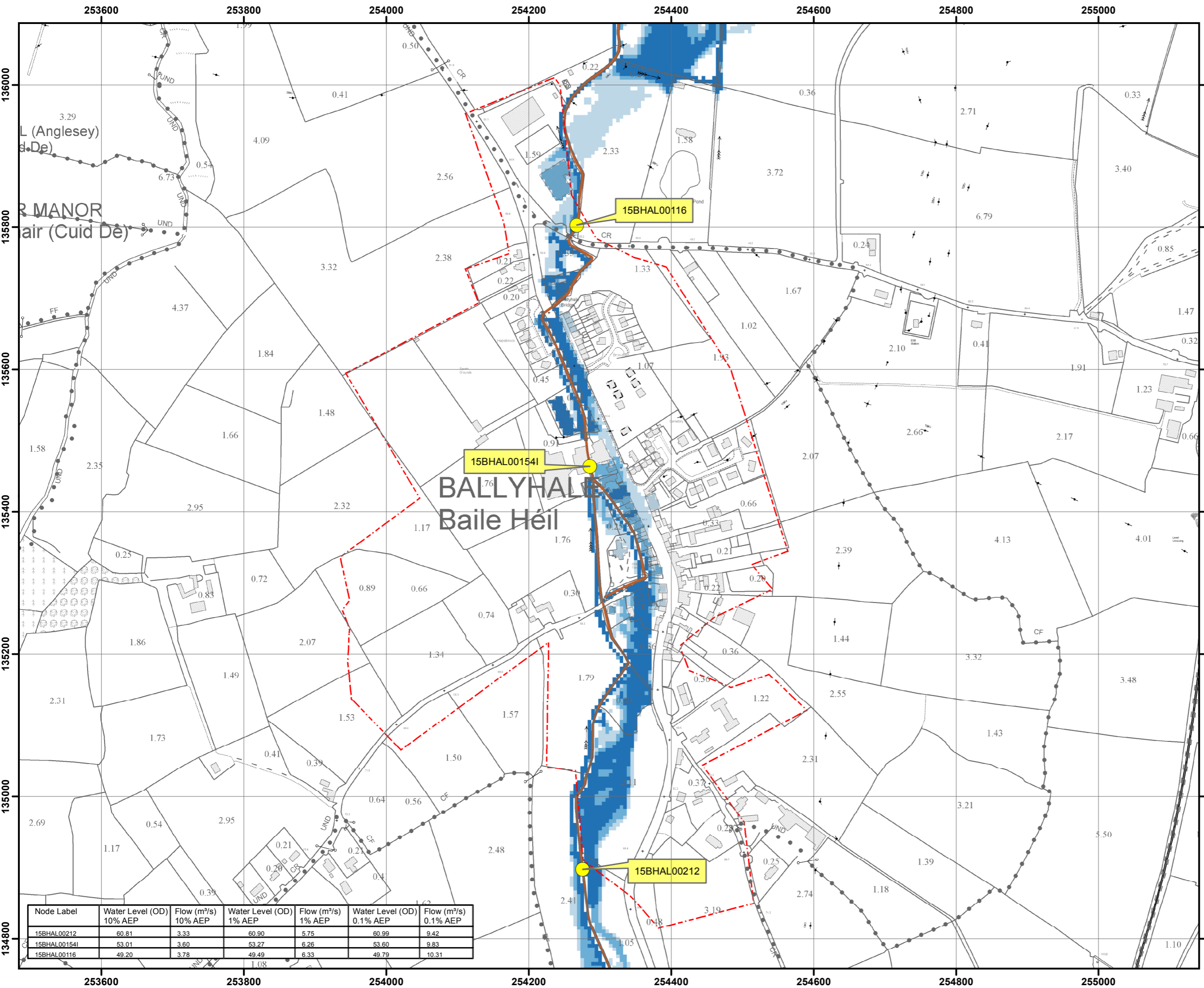
author DJG

scale 1:2000

sheet size A1

drawing no. 200055-DBFL-Z0-SP-SK-C-1011





IMPORTANT USER NOTE:
 THE VIEWER OF THIS MAP SHOULD REFER
 TO THE DISCLAIMER, GUIDANCE NOTES
 AND CONDITIONS OF USE THAT
 ACCOMPANY THIS MAP.

- Legend**
- 10% Fluvial AEP Event
 - 1% Fluvial AEP Event
 - 0.1% Fluvial AEP Event
 - Modelled River Centreline
 - AFA Extents
 - Node Point
 - Node ID Node Label

FINAL

REV:	NOTE:	DATE:
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Map:	
Ballyhale Fluvial Flood Extents	
Map Type: EXTENT	
Source: FLUVIAL	
Map Area: HPW	
Scenario: CURRENT	
Drawn By : C.C.	Date : 20 December 2016
Checked By : E.H.	Date : 20 December 2016
Approved By : G.G.	Date : 20 December 2016
Drawing No. :	
O15BAE_EXFCD_F0_01	
Map Series : Page 1 of 2	
Drawing Scale : 1:5,000 @ A3	

Node Label	Water Level (OD)		Flow (m³/s)		Water Level (OD)		Flow (m³/s)	
	10% AEP	1% AEP	10% AEP	1% AEP	0.1% AEP	1% AEP	0.1% AEP	
15BHAL00212	60.81	60.90	3.33	5.75	60.99	9.42	9.42	
15BHAL001541	53.01	53.27	3.60	6.26	53.60	9.83	9.83	
15BHAL00116	49.20	49.49	3.78	6.33	49.79	10.31	10.31	



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3 Air Quality & Noise

3.1 Introduction

This section of the Constraints Report identifies the key potential air quality and noise impacts as a result of the proposed Ballyhale Flood Relief Scheme. The objective of the Flood Relief Scheme is to alleviate the risk of flooding to the community of Ballyhale. Ballyhale is a village in the south of County Kilkenny on relatively flat land within the catchment of the Little Arrigle River which is a tributary of the River Nore. Ballyhale is affected by a tributary of the Little Arrigle River called the Ballyhale River. 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.

The South Eastern CFRAM study commissioned by the Office of Public Works (OPW) determined that 25 properties in Ballyhale are at risk of flooding for the current day 1% Annual Exceedance Probability (AEP) event. There is also non-residential flooding to roads and agricultural lands.

3.2 Assessment Methodology

This part of the study focuses on:

- Identification of locations that are potentially sensitive to increased noise levels and air quality pollutant and dust concentrations during construction and operation of the flood relief scheme.
- Identification of the possible phases of construction and operation of the flood relief scheme that may result in increased noise levels and air quality pollutant and dust concentrations.
- A qualitative description of the existing air quality in Ballyhale and the surrounding environs
- A qualitative assessment of the existing noise climate in Ballyhale and the surrounding environs.

3.3 Baseline Environment

3.3.1 Existing Air Quality

Under the Clean Air for Europe Directive, EU member states must designate "Zones" for the purpose of managing air quality. For Ireland, four zones were defined in the Air Quality Standards Regulations (2011). The zones were amended on 1st January 2013 to take account of population counts from the 2011 CSO Census and to align with the coal restricted areas in the 2012 Regulations (S.I. No. 326 of 2012). Zone A is Dublin, Zone B is Cork City and Zone C includes 24 large towns and Zone D is the remainder of the State. The Ballyhale Flood Relief Scheme constraints study area is within Zone D. The air quality in Zone D is well within the limits outlined in the Air Quality Standards Regulations 2011. The Air Quality Index for Health indicates that the air quality in Ballyhale is 'Good'.

The EPA manages the National Ambient Air Quality Network. The closest ambient air quality monitoring station is located at Seville lodge, Kilkenny (within Zone C), approximately 20km north-north-west of Ballyhale which records real time levels of various analytes. Results here are primarily linked to road traffic emissions.

3.3.2 Existing Noise Environment

In the Guidance Note for Noise: Licence Applications, Surveys and Assessments in Relation to Scheduled Activities (NG4) (2016) issued by the EPA the definition of noise is given (guidance only) as follows:

“Any sound, that has the potential to cause disturbance, discomfort or psychological stress to a subject exposed to it, or any sound, that could cause actual physiological harm to a subject exposed to it, or physical damage to any structure exposed to it, is known as noise.”

In January 2019, Kilkenny County Council produced a Noise Action Plan 2019-2023 in accordance with the Environmental Noise Regulations (S.I. No. 140 of 2006). The Action Plan contains noise maps generated by the National Roads Authority (NRA) and subsequently presented to the European Commission by the EPA. The noise levels indicated are attributed only to the specific source of noise being considered, namely the traffic on the major roadways and therefore do not consider any other noise source. These noise maps are presented in 5dB contour bands beginning at 55dB L_{den} and

ranging up to 75dB L_{den} . These maps also give an indication of noise levels that are predicted greater than 75dB L_{den} . L_{night} maps range from 50dB to 70dB L_{night} . Ballyhale is located along the regional road R448 and the noise maps produced do not cover this area as there is less than 3 million vehicles per year on the R448.

There is the potential for a temporary increase in traffic volumes during the construction phase, which may have the potential to result in increased noise levels. The construction process may have the potential to result in elevated air pollutant and dust concentrations due to earth movements, etc. during the construction phase. Measures will be implemented during the construction phase to ensure there is no significant noise or air quality and dust impact on sensitive receptors, including ecological receptors during construction.

The proposed flood relief scheme will not increase traffic volumes and hence, will not result in higher noise levels or elevated air pollutant concentrations during the operational phase. No other significant noise or air pollutant sources are envisaged during the operational phase of the flood relief scheme.

3.3.3 Noise Sensitive Receptors

Ballyhale is primarily located along one street, resulting in a linear pattern that extends approximately 500m in length. This linear pattern takes the form of a meandering, sinuous road alignment. There are some smaller roads leading off the Main street, but there is little development on them. Figure 1.1 below shows the AFA boundary (constraints area).

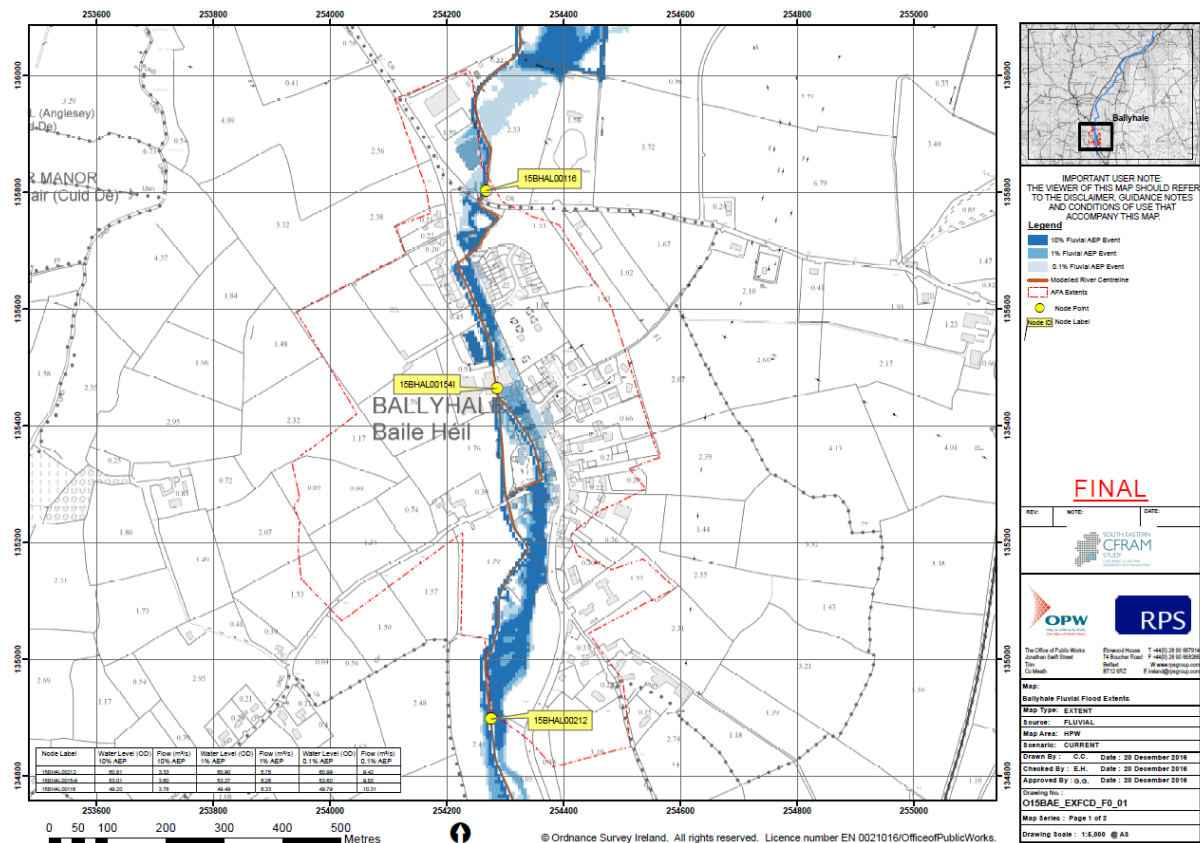


Figure 3.1: Constraints Boundary

Sensitive receptors included within the red line boundary include St Martin of Tours Church, Ballyhale Pre School, Scoil Phádraig N.S, St Martin of Tours Catholic Church, Ballyhale Health Centre, Ballyhale Shamrocks GAA Club and one large industrial premises to the north of the constraints area, namely Signiatec Ltd, based in Kiltorcan Business Park. Arrigle Business Park located in the centre of the village also accommodates commercial and industrial premises. There are approximately 60+ residential properties, mainly located within residential developments and a small number of single dwellings, some of which are agricultural holdings.

The River Barrow and River Nore SAC designated area is located to the north of the constraints area as shown in Figure 1.2. This SAC is designated for numerous qualifying interests. The potential disturbance on protected species due to noise and increased dust concentrations would not be considered to be potentially significant, given the nature and scale of the proposed project. With regards to potential air pollutant and dust emissions from the proposed project, it is likely that the main emission sources would comprise of vehicular emissions and windblown dusts which may be significant at certain locations within the constraints area.



Figure 3.2: River Barrow and River Nore SAC Boundary

3.4 Predicted Impacts

The main potential impacts on air quality and noise will arise during the construction phase of the flood relief scheme. Traffic noise generated by trucks accessing the area and machinery used for earth movements, such as diggers and dozers, will be the main source of noise. However, this source of noise will be for the duration of the construction phase only and in the longer term no noise will be generated during the operation of the flood relief scheme.

Similarly, air pollutant and dust emissions will arise during the construction of the flood relief scheme due to both vehicle emissions and windblown dust emission generated during the construction of the flood relief scheme. Windblown dusts during suitable meteorological conditions will potentially be the main source of air emissions. Specific dust control measures will be employed to reduce the dust emissions when suitable meteorological conditions prevail. Again, these emissions will only arise during the construction phase of the flood relief scheme

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4 Water Environment

4.1 Introduction

This chapter describes the scope of works and methods applied in the identification and assessment of the potential effects of the construction and operation of the Ballyhale Flood Relief Scheme upon the receiving water environment and its effects on hydrology, hydrogeology and water quality.

The assessment techniques used are aimed at identifying constraints on the layout, design and construction methods of the proposed development as a result of the water environment, including areas in which development should be avoided and areas in which mitigation measures are required.

The objectives of this assessment are to:

- Undertake a field and desktop study to describe existing surface water & groundwater features within the study area;
- Assess the scheme proposals with regard to adequate capacity to collect, treat and discharge run-off generated by the proposed project;
- Assess the impact of climate change;
- Review the scheme design such that it will protect both human health and the aquatic environment by minimising adverse impact on the quality of natural waters;
- Establish the predicted effect of the works on groundwater quality and quantity;
and
- Identify and incorporate appropriate mitigation measures, where required.

NOTE: Detailed assessment of the hydrological flow assessments and issues relating to existing and proposed flood risk are dealt with in supporting Hydrological Report and Hydraulic Model Report.

4.1.1 Impact Assessment - Scope of Works

The report identifies and assesses the potential effects on the following:

- Existing natural drainage patterns;
- Water quality of receiving waters;
- Aquifer systems and their vulnerability.

To quantifiably assess the preceding, this chapter will:

- Outline relevant policy and legislation relating to the water environment.
- Summarise consultation responses in relation to this assessment.

- Provide baseline information and identify sensitive receptors.
- Identify potential effects, including potential cumulative effects.
- Assess the significance of any adverse impacts and resulting effects based on the magnitude of the impact and the sensitivity of the receptors.
- Outline detailed mitigation measures where required.
- Provide a residual impact assessment.

4.1.2 European, National and Regional Policy

Key European and National legislative policy relating to the water environment have been considered within this assessment and are contained within Table 4.1.

Table 4.1: Key Legislation / Policy

Policy	Legislation
EU	Water Framework Directive (2000/60/EC)
	Freshwater Fish Directive (2006/44/EC, replacing 78/659/EEC)
	Environmental Liability Directive (2004/35/EC)
National	Local Government (Water Pollution) Acts 1977 and 1999 - 2007
	European Communities Environmental Objectives (Surface Waters) Regulations 2009
	Local Government (Water Pollution) Act, 1977 (Water Quality Standards For Phosphorus) Regulations, 1998
	European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations, 2009
Local	Geological Survey of Ireland, Co. Kilkenny Groundwater Protection Scheme
	Kilkenny County Council – Kilkenny County Development Plan

Further to the above legislation, Irish National bodies including Transport Infrastructure Ireland (TII, formally National Roads Authority), the Office of Public Works (OPW) and the Environmental Protection Agency (EPA) provide detailed guidance to the preparation and content required for an EIAR in relation to the water environment. In addition, other regional and leading supplementary industry guidance referred to as part of this assessment are as outlined in Table 4.2.

Table 4.2: Key Supplementary Guidance

Body	Guidance
Transport Infrastructure Ireland (TII)	Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA, 2009)
	Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2008)

	Guidelines for The Crossing of Watercourses During the Construction of National Road Schemes (NRA, 2008)
	Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan (NRA 2007)
	Road Drainage and the Water Environment (DN-DNG-03065)
	Design of Earthworks Drainage, Network Drainage, Attenuation & Pollution Control (DN-DNG-03066)
	Drainage Design For National Road Schemes - Sustainable Drainage Options (RE-CPI-07001)
	Drainage Systems For National Roads [DN-DNG--03022]
Office of Public Works (OPW)	The Planning System and Flood Risk Management (OPW, 2009)
	OPW Flood Maps (http://www.floodinfo.ie/)
Environmental Protection Agency (EPA)	Guidelines On The Information To Be Contained In Environmental Impact Assessment Reports (Draft, EPA, August 2017)
	EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) (EPA, Sept. 2003)
	Geo Portal (https://gis.epa.ie/EPAMaps/)
Department of Housing Planning and Local Government	River Basin Management Plan for Ireland 2018 – 2021
Inland Fisheries Ireland (IFI)	Guidelines on protection of fisheries during construction works in and adjacent to waters (Inland Fisheries Ireland 2016)
CIRIA	The SUDS Manual (CIRIA C753)
	Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (CIRIA C532)
	Control of Water Pollution from Linear Construction Sites (CIRIA C648)
	Development and Flood Risk – Guidance for the Construction Industry (CIRIA 624)
	The Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (C532) (2001)
	Environmental Good Practice on Site Guide (C741) (2015)
Dublin City Council (DCC)	The Greater Dublin Strategic Drainage Study [GDSDS] (Dublin City Council et al., 2005)
Institute of Geologists Ireland (IGI)	Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements (2013)
Environment Agency (UK) EA	PPG1: General Guide to the Prevention of Pollution (UK Guidance Note)
	GPP 5 Works and Maintenance in or near Water (UK Guidance Note)
	PPG6 Working at Construction and Demolition Sites (UK Guidance Note)

4.2 Assessment Methodology

This assessment has been undertaken using a qualitative assessment based on experienced professional judgement and assessment of compliance with statutory and industry guidance, including site visits.

4.2.1 Desktop Study

The desktop study involved collation and assessment of the relevant information from the following information sources.

- Consultation responses.
- Mapping and aerial photography to assess land usage on the site and its environs and to identify water features and watercourse catchments.
- Site surveys including topographic, underground utilities, orthophotography.
- Utility and Local Authority infrastructure record drawings.
- EPA Geo Portal (<https://gis.epa.ie/EPAMaps/>).
- Office of Public Works National Flood Hazard Mapping (<http://www.floodinfo.ie/>).
- Water Quality Monitoring Databases and Reports.
- Information of the hydrology and drainage of the study area from EPA www.epa.ie.
- Geological Survey Ireland Data Viewer (<https://www.gsi.ie>).

4.2.2 Site Walkover Assessment

Site walkover surveys were undertaken in June 2020 with the purpose of identifying / verifying existing site drainage characteristics and water features.

The site walkover surveys encompassed the whole site area, with emphasis placed upon areas likely to be affected by proposed route alignments in order to fully assess potential issues with regards to:

- Water crossings (culverts / bridges) required;
- Flooding;
- Existing runoff patterns;
- Existing groundwater levels and flow paths;
- New outfalls (discharges) required;
- Potential for impact on surface water quality due to construction and operation of the scheme.

4.2.3 Scoring Matrix for Impact Assessment

Impact assessment was carried out with reference to the EPA's Guidelines On The Information To Be Contained In Environmental Impact Assessment Reports (Draft August 2017) and the TII "Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes".

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.

Receptor Sensitivity

The sensitivity of the receiving environment has been categorised on a scale from "high" to "negligible" as defined in Table 4.3.

Sensitivity criteria is based on:

- Vulnerability of a receptor to a particular pressure (degree of environmental response to any particular impact); and
- The 'value' of the receptor (e.g. an area of international importance should be considered more sensitive to the impact than an area of little or no conservation value).

Table 4.3: Receptor Sensitivity

Sensitivity of Environment	Criteria	Examples
High	Attribute has a high quality and rarity	Surface waterbody supporting aquatic site/species protected under European and Irish legislation. Watercourse with High water quality supporting very sensitive aquatic resource. Principal aquifer providing a regionally important drinking water resource. Aquifer in drinking water protection area.
Medium	Attribute has a medium quality and rarity	Surface waterbody with Good/Moderate water quality supporting a locally important fishery resource or ecosystem. Aquifer providing a locally important drinking water resource. Surface waterbody supporting salmonid resource.
Low	Attribute has a low quality and rarity	Surface waterbody with Low water quality. Surface waterbody supporting low value aquatic resource. Poor Aquifer which is Generally Unproductive except for Local Zones. Surface waterbody whose environmental equilibrium copes well with all natural fluctuations but cannot absorb some changes greater than this without alteration of its present character.
Negligible	Attribute resilient to environmental change	Surface waterbody with poor water quality. Surface waterbody whose environmental equilibrium is resilient to changes greater than natural fluctuations without detriment to its natural hydrological morphology and water quality characteristics. Heavily engineered or artificially modified; may dry up during dry spells (no base flow). Poor Aquifer which is Generally Unproductive.

Impact Magnitude

The Impact Magnitude has been categorised on a scale from “high” to “negligible” as defined in Table 4.4.

Table 4.4 Impact Magnitude Criteria

Magnitude of Impact	Criteria	Examples (non-exhaustive)
High	Results in permanent impact to attribute and/or quality and integrity of attribute.	Loss or extensive change to a water body or water dependant habitat. Large change in Predicted Flood Level (>100mm). Impact to designated groundwater dependant habitat. Large change in regional aquifer properties. Reduction in quality or amenity value. Extensive loss of fishery. Changes to stream morphology preventing fish/ mammal movement.
Medium	Results in temporary or minor impact to attribute and/or quality and integrity of attribute.	Change in predicted peak flood level >50mm. Impact to locally important groundwater dependant habitat. Temporary reduction in quality or amenity value. Temporary impact to fishery.
Low	An impact that causes slight measurable changes to the environment or temporary changes to small portion of attribute	Minor change in predicted peak flood level <50mm. Minor deterioration in environmental water quality unlikely to affect the most sensitive receptor. Local changes to groundwater levels.
Negligible	An Impact without measurable or noticeable consequences	Negligible Change in predicted peak flood level (<10mm). Temporary insignificant change in hydrological/ hydrogeological and water quality conditions not exceeding those expected due to naturally occurring fluctuations

Factors which influence the Impact magnitude include the type of impact and duration. These aspects are considered with reference to the TII and EPA guidance as detailed below.

Table 4.5 Types of Impact

Potential Impact	Description
Direct Impact	The existing geological, hydrological or hydrogeological environment is altered in whole or in part as a consequence of scheme construction or operations.
Indirect Impact	The existing geological, hydrological or hydrogeological environment beyond the proposed route corridors is altered by activities related to scheme construction and/or operation.
No predicted impact	The proposed route corridor has neither a negative nor a positive impact on the geological, hydrological or hydrogeological environment.

Table 4.6 Impact Duration (EPA 2017)

Duration	Description
Momentary	Lasting from seconds to minutes
Brief	Effects lasting less than a day
Temporary	Effects lasting less than a year
Short-Term	Effects lasting one to seven years.
Medium Term	Lasting seven to fifteen years.
Long Term	Lasting fifteen to sixty years.
Permanent	Lasting over sixty years
Reversible	Impacts that can be undone, for example through remediation or restoration

Impact Significance

The significance of the identified potential impacts is acknowledged by the combination of the magnitude of the potential impact (Table 4.4) and sensitivity of the receptor (Table 4.3). The generalised significance terms used in this assessment is in line with the EPA guidance reproduced in Figure 4.1 below

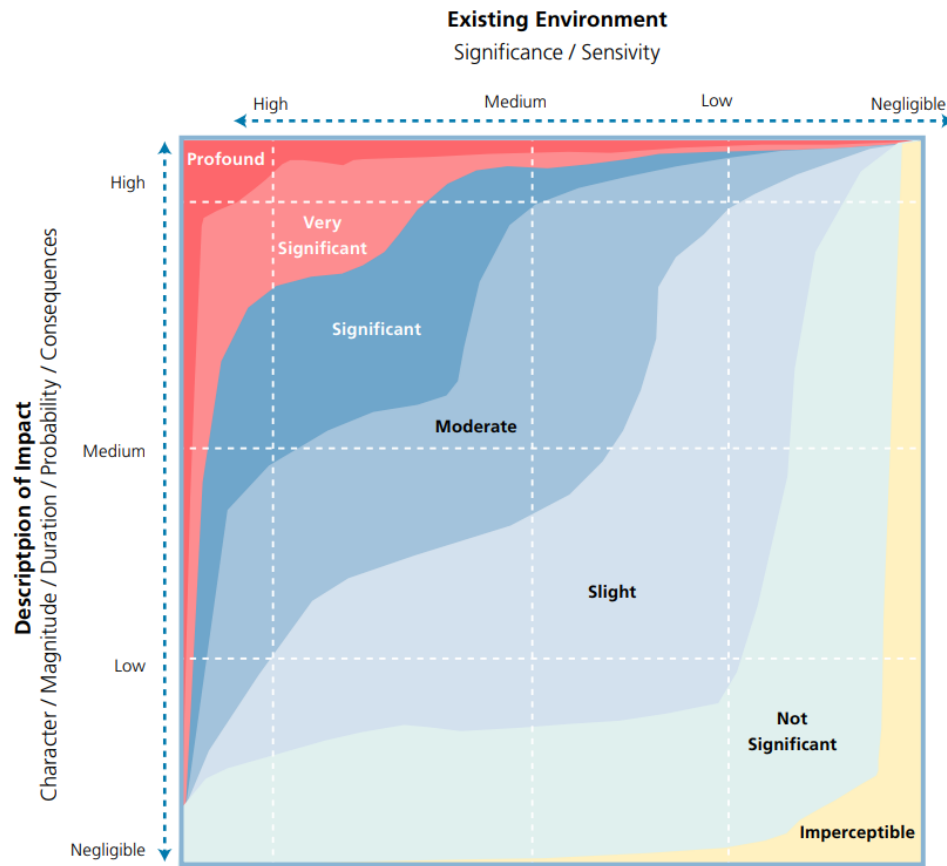


Figure 4.1: Significance Effect Matrix

In addition to significance, the effect on the receiving environment may be Positive, Neutral or Adverse.

4.3 Baseline Environment

4.3.1 Hydrological Setting

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 4.2: Local Watercourses

EPA mapping indicates that the Little Arrigle/Ballyhale River are not designated Salmonid watercourses however the downstream River Nore is governed by salmonid regulations at the discharge of the Little Arrigle to the Nore (approx. 7km downstream of Ballyhale).

4.3.2 Hydrogeological Setting

Sandstone Bedrock underlies the entire scheme. The majority of the bedrock underlying the scheme is described as yellow and red sandstone and green mudstone, which are part of the Kiltorcan Formation, while at the northern end the bedrock is described as sandstone, shale and thick limestone which are part of the Porters Gate Formation. The County Kilkenny Groundwater Protection Scheme notes that the shales of the overlying Portersgate formation are less permeable and can act as a confining layer and artesian flows have been obtained where wells have breached them to tap into the Kiltorcan sandstones below. 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 .

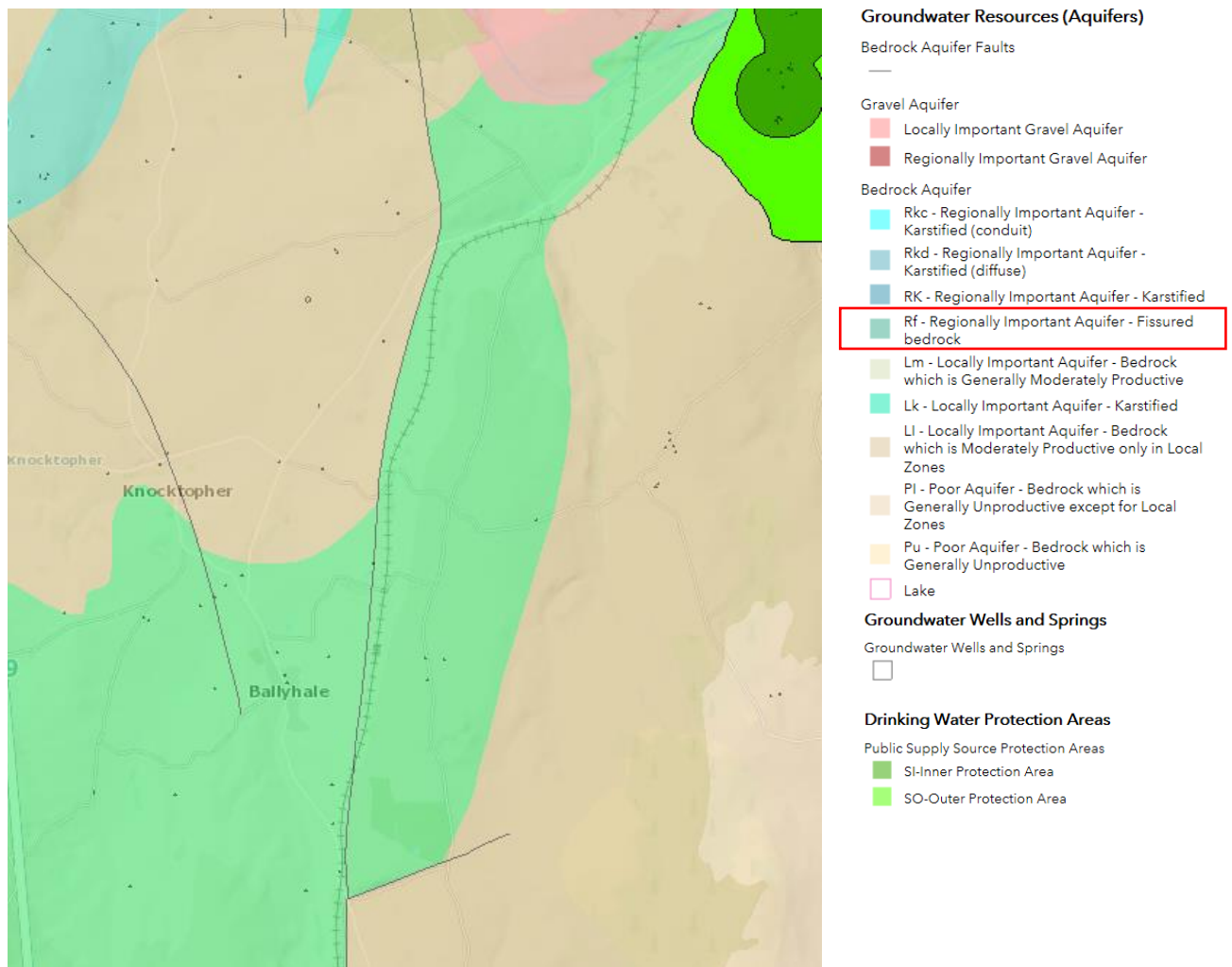


Figure 4.3: Hydrogeological Setting

Groundwater Vulnerability is a term used to represent the intrinsic geological and hydrogeological characteristics that determine the ease with which groundwater may be contaminated by human activities. Groundwater vulnerability is classed from moderate to extreme across the southern half of the project extents due to the shallow depth to bedrock and relatively permeable soils. Areas of highest vulnerability correspond to areas of near surface bedrock and thin soil depths. It is noted that the aquifer vulnerability classification does not consider the nature of the underlying ‘receiving’ aquifer with respect to resource value or significance of pollution occurring and is only a reflection on the protection afforded to the aquifer by overlying deposits.

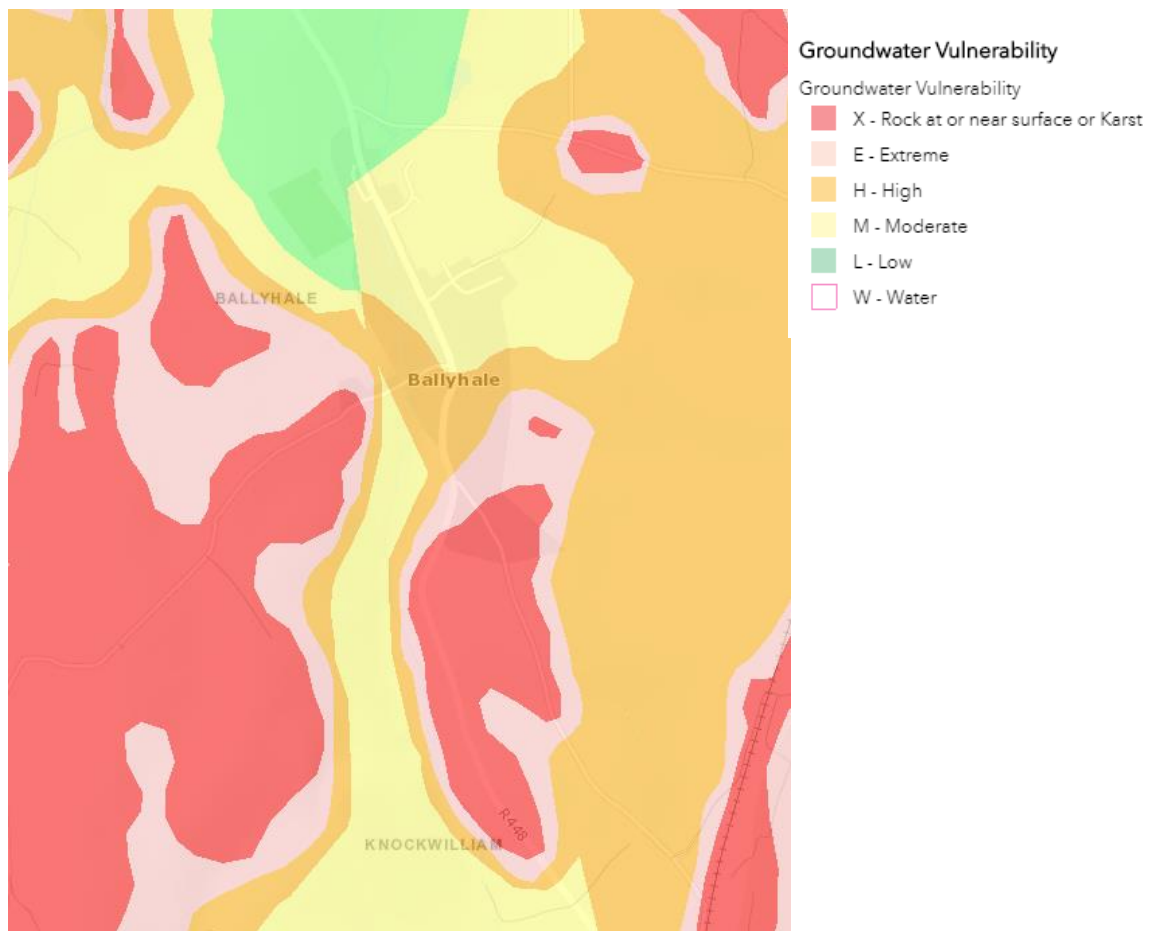


Figure 4.4: Groundwater Vulnerability

4.3.3 Topography

The proposed scheme traverses an area of undulating lands generally falling from south to north. The Little Arrigle and Ballyhale Rivers flow in local topographic valleys. Higher elevation lands are present to the south east and west.

A detailed topographical survey of all lands, watercourses, and existing infrastructure affected by the proposed works has been carried out to inform the design for the scheme. In addition to this, LIDAR topographical data has been used to determine the topography beyond the proposed scheme extents.

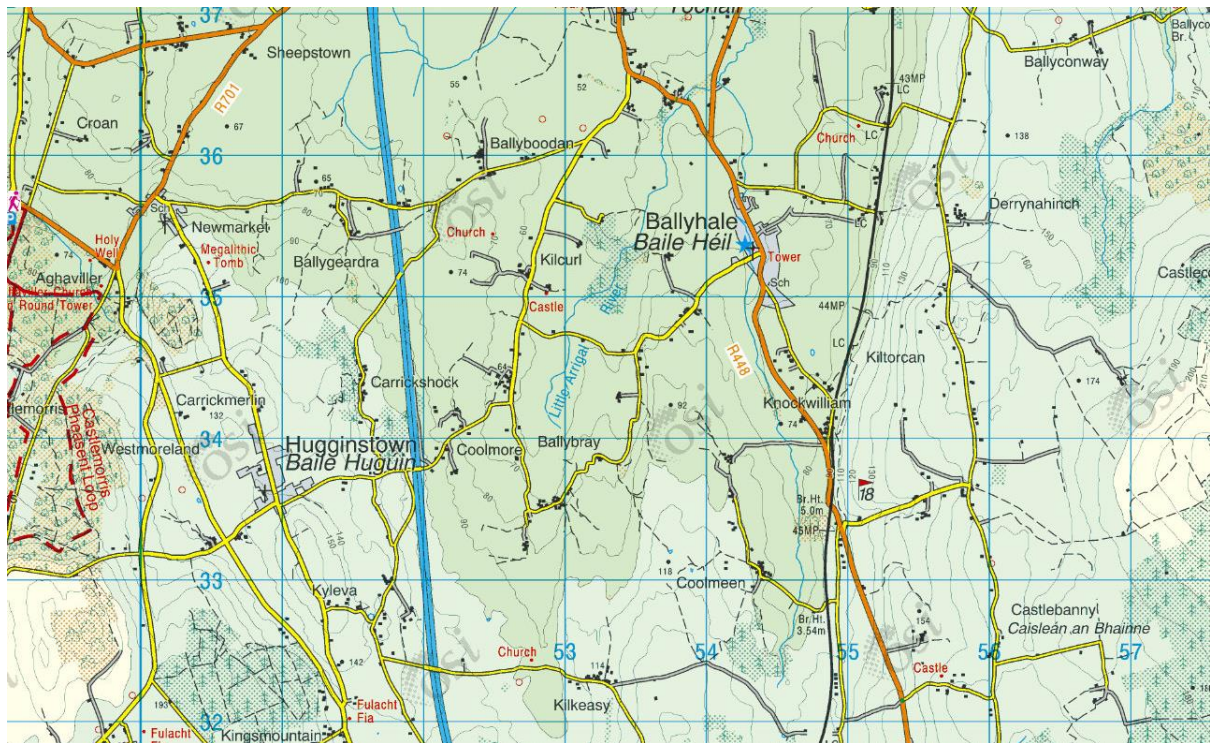


Figure 4.5: Topography

4.3.4 Water Quality

EPA Q Rating

The EPA operate a biological river quality (Q or biotic index) classification system based on biological sampling at water monitoring stations. These values are based primarily on the relative proportions of pollution sensitive to pollution tolerant macroinvertebrates resident at a river site.

Table 4.7 Q Biotic Indices - Interpretation

Q Value	WFD Status	Pollution Status
Q5, Q4-5	High	Unpolluted
Q4	Good	Unpolluted
Q3-4	Moderate	Slightly polluted
Q3, Q2-3	Poor	Moderately polluted
Q2, Q1-2, Q1	Bad	Seriously polluted

Q-rating data is available for the Little Arrigle River upstream and downstream of the proposed development, refer to Table 4.8 for results.

Table 4.8 EPA Water Quality Monitoring Q-Rating Values

Waterbody	Station	Location E/N	EPA Q-Rating
Little Arrigle	RS15L010040	253005.1 / 134746	3-4 (Moderate)
Little Arrigle	RS15L010100	254487 / 137328	4 (Good)

WFD Classification -Surface Water

The Little Arrigle River has been assigned as “At risk” status under WFD classifications. The watercourses are not classified under the WFD in the direct vicinity of the site however the Little Arrigle River is classed as Moderate downstream of the site near its confluence with the Nore. The Nore is also classified as Moderate at this location.

WFD Classification -Groundwater

The groundwater body underlying the scheme extents is the Thomastown waterbody which is classed as “At risk” status under the Water Framework Directive (WFD). The groundwater body quality is classed as Good.

4.3.5 Meteorological Data Summary

Rainfall data for the area has been extracted from Met Eireann Data Charts, the annual rainfall data from 1981-2010 indicates the long term average annual rainfall in the vicinity of the scheme is between 950-1050mm. Rainfall data values are higher in the higher elevation areas south and east of the village.

4.3.6 Abstractions

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. A number of smaller wells/springs are mapped by GSI in the vicinity of the site and may be used for drinking water.

There is a diversion/abstraction on the Little Arrigle at Goatsbridge which feeds a commercial fish farm (trout).

4.3.7 Discharges

A Wastewater treatment plant is present in Ballyhale at the northern edge of the village adjacent to the Ballyhale River. Historically this plant discharged to the Ballyhale River at this location however a pumped discharge route was installed to move this discharge point further downstream where greater assimilative capacity is available in the watercourse.

4.3.8 Designated sites

Designated sites (sites designated as conservation areas under Irish or EU legislation) within 5km of the proposed scheme or within the hydrological catchment of the scheme are indicated in Table 4.9 below.

Table 4.9: Designated Sites

Station ID	Name	Designation	Distance	Commentary
002162	River Barrow and River Nore	Special Area of Conservation (SAC)	<1 km	<p>Freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and includes also the tidal elements and estuary as far downstream as Creadun Head in Waterford.</p> <p>Designation partially as a result of the presence of sensitive aquatic ecology including salmon, lamprey, Twaité Shad, Freshwater Pearl Mussel and extremely rare Nore Freshwater Pearl Mussel. The populations of Nore Freshwater Pearl Mussel are well upstream of the confluence of the Little Arrigle (population located between Abbeyleix and Ballyragget)</p> <p>Site is downstream of the works and certain proposed works may slightly overlap with SAC site extents. Site considered sensitive to potential hydrological impacts on water quality/quantity from the scheme.</p>
004233	River Nore SPA	Special Protection Area (SPA)		<p>The River Nore SPA is a long, linear site following the Nore and some tributary watercourses. Its designation is associated with ornithological interest.</p> <p>Although downstream of the subject site the designation is not considered particularly sensitive to water impacts at the subject site</p>
000839	Kilkeasy Bog	Proposed Natural Heritage Area (PNHA)	4.5 km	<p>Kilkeasy Bog is a large wetland area comprising small lakes, fen, wet grassland, cutover bog and heathland</p> <p>Site is not downstream of the proposed scheme and therefore is not sensitive to water impacts from the scheme</p>
000404	Hugginstown Fen	SAC, PNHA	4.5 km	<p>Area of swamp and floating fen developed in a small valley in hilly country. It is underlain by limestone glacial till overlying and surrounded by acid Old Red Sandstone. Designated based on alkaline fens.</p> <p>Site is not downstream of the proposed scheme and therefore is not sensitive to water impacts from the scheme</p>

Based on the above review River Barrow and River Nore SAC is considered to be sensitive to hydrological hydrological/hydrogeological impacts at the subject site.

4.3.9 Flooding

NOTE: Detailed assessment of the hydrological flow assessments and issues relating to existing and proposed flood risk are dealt with in supporting Hydrological Report and Hydraulic Model Report. A high level overview is presented below

Historical Flood Data

As part of the desktop study, historic and predicted flood risk mapping published by the OPW on the Flood Hazard Mapping Website <http://www.floodinfo.ie/> was reviewed. Historical flood records notes KCC records of recurring flooding in Ballyhale and notes records of flooding affecting Ballyhale in November 2000 & November 2002

The South Eastern CFRAM carried out a study of flooding in Ballyhale which included hydraulic modelling. The study predicted that out of bank overland flooding occurs upstream of the village on the eastern bank of the Ballyhale River. These floodwaters flow overland across agricultural lands and into the village. Flooding was also shown to be affected by a number of undersized culvert/bridge structures on the watercourse through the village. The study estimated that 25 properties in Ballyhale are at risk of flooding for the current day 1% Annual Exceedance Probability (AEP) event. The existing flood mechanisms are to be verified as part of the updated hydraulic modelling exercise in the current scheme phase.

River Flows

River flows were derived as part of the Hydrological Assessment for the scheme and are detailed in the supporting Hydrology Report. Selected river flows are presented below to provide a guide on the flow conditions in the local watercourses

Table 4.10: River Flows

Location	Hydrology Report Ref	Qmed (m ³ /s)	Q100 Flow (m ³ /s)	Q1000 Flow (m ³ /s)
Ballyhale River – Upstream of Village	15_1358_3	1.67	4.70	7.74
Little Arrigle River – Upstream of confluence with Ballyhale River	15_1182_7	1.56	4.33	7.07

Existing Flooding

To be updated based on Baseline Model Results.

Impact of Proposed Scheme

To be updated based on Selected Option Results

4.3.10 Baseline Summary and Sensitivities

The baseline assessment identified several hydrological receptors that have the potential to demonstrate sensitivity to the development proposed at the site. These are:

- Watercourses - Ballyhale River and the downstream Little Arrigle/ Nore / Barrow ;
- Aquifer - Bedrock Aquifer

The Sensitivity of these receptors identified is determined in accordance with the rationale described in Section 4.2.3.

Table 4.11 Baseline Summary

Type	Receptor	Sensitivity	Rationale
Hydrological (Watercourse)	Ballyhale River and the downstream Little Arrigle/ Nore / Barrow	High	Designated SAC sensitive to water quality/quantity impacts located downstream Sensitive aquatic ecology downstream including salmon designations and
Hydrogeological (Aquifer)	Bedrock Aquifer	Medium	Regionally Important Aquifer subject to downstream abstraction for drinking water

4.4 References

- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA , 2009);
- Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2008);
- Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan (TII);
- Design of Earthworks Drainage, Network Drainage, Attenuation & Pollution Control (DN-DNG-03066) (TII);
- Drainage Design For National Road Schemes - Sustainable Drainage Options (TII);
- Guidelines for The Crossing of Watercourses During the Construction of National Road Schemes (NRA, 2008);
- Drainage Systems For National Roads [NRA HD 33/15] (TII);
- The Planning System and Flood Risk Management (OPW, 2009);
- Draft River Basin Management Plan 2018 – 2021. Department of Housing Planning and Local Government;
- Guidelines on protection of fisheries during construction works in and adjacent to waters 2016. Inland Fisheries Ireland (IFI);
- Guidelines On The Information To Be Contained In Environmental Impact Assessment Reports (Draft August 2017) (EPA);
- EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) Sept. 2003;
- Geo Portal (<https://gis.epa.ie/EPAMaps/>) (EPA);
- The SUDS Manual (CIRIA C753) (CIRIA);
- Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (CIRIA C532);
- Control of Water Pollution from Linear Construction Sites (CIRIA C648);
- Development and Flood Risk – Guidance for the Construction Industry (CIRIA 624);
- PPG01: General Guide to the Prevention of Pollution (UK Guidance Note);
- GPP 5 Works and Maintenance in or near Water (UK Guidance Note);
- PPG06 Working at Construction and Demolition Sites (UK Guidance Note);
- Environmental Good Practice on Site (C692) (2010) (CIRIA);
- Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements. (2013) Institute of Geologists of Ireland (IGI);

- Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects, Dept of the Environment Heritage and Local Government;
- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, Department for Environment, Food and Rural Affairs (UK);
- Geological Survey of Ireland, Co. Kilkenny Groundwater Protection Scheme
- Geological Survey Ireland Spatial Resources
<https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228>
- Kilkenny County Council – Kilkenny County Development Plan.

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5 Land and Soils

5.1 Introduction

This chapter describes the scope of works and methods applied in the identification and assessment of the potential effects of the construction and operation of the Ballyhale Flood Relief Scheme with regard to Land and Soils.

The assessment techniques used are aimed at identifying the likely significant impacts, proposing suitable mitigation measures if required and identify the residual impacts.

5.1.1 Impact Assessment - Scope of Works

The report will identify and assesses the potential effects on the following:

- Existing bedrock geology
- Structural Geology;
- Superficial Geology;
- Extractive Industries;
- Geological Heritage Areas

To quantifiably assess the preceding, this chapter will:

- Outline relevant policy and legislation relating to the land and soils environment.
- Summarise consultation responses in relation to this assessment.
- Provide baseline information and identify sensitive receptors.
- Identify potential effects, including potential cumulative effects.
- Assess the significance of any adverse impacts and resulting effects based on the magnitude of the impact and the sensitivity of the receptors.
- Outline detailed mitigation measures where required.
- Provide a residual impact assessment.

5.1.2 European, National and Regional Policy

Key European and National legislative policy relevant to this assessment are contained within Table 5.1.

Table 5.1: Key Legislation

Policy	Legislation
EU	Water Framework Directive (2000/60/EC)
	Environmental Liability Directive (2004/35/EC)
National	Planning and Development Regulations 2001
	Planning and Development Act 2000
Local	Geological Survey of Ireland, Co. Kilkenny Groundwater Protection Scheme
	Kilkenny County Council – Kilkenny County Development Plan

Further to the above legislation, various bodies including; Transport Infrastructure Ireland (TII, formally National Roads Authority); the Institute of Geologists Ireland (IGI); and the Environmental Protection Agency (EPA) provide detailed guidance to the preparation and content required for an EIAR in relation to the geological environment. In addition, other regional and leading supplementary industry guidance referred to as part of this assessment are as follows:

Table 5.2: Key Supplementary Guidance

Body	Guidance
Transport Infrastructure Ireland (TII)	Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA , 2009)
	Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2008)
	Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan
	The Management Of Waste From National Road Construction Projects
	Design of Earthworks Drainage, Network Drainage, Attenuation & Pollution Control (DN-DNG-03066)
Environmental Protection Agency (EPA)	Guidelines On The Information To Be Contained In Environmental Impact Assessment Reports (Draft August 2017)
	EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) Sept. 2003
	Geo Portal (https://gis.epa.ie/EPAMaps/)
CIRIA	The SUDS Manual (CIRIA C753)
	Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (CIRIA C532)
	Control of Water Pollution from Linear Construction Sites (CIRIA C648)
	Environmental Good Practice on Site (C692) (2010)
Institute of Geologists of Ireland (IGI)	Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements. (2013)
Dept of the Environment Heritage and Local Government	Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects
Department for Environment, Food and Rural Affairs (UK)	Construction Code of Practice for the Sustainable Use of Soils on Construction Sites

5.2 Assessment Methodology

This assessment has been undertaken using a qualitative assessment based on experienced professional judgement and assessment of compliance with statutory and industry guidance, including site visits.

5.2.1 Desktop Study

The desktop study involved collation and assessment of the relevant information from the following information sources.

- Consultation responses
- Vector mapping and aerial photography to assess land usage on the site and its environs
- Site surveys including topographic, underground utilities, orthophotography and site geotechnical investigations
- Utility & Local Authority infrastructure record drawings
- EPA Geo Portal (<https://gis.epa.ie/EPAMaps/>)
- Geological Survey Ireland Data Viewer (<https://www.gsi.ie>).

5.2.2 Site Walkover Assessment

Site walkover surveys were undertaken in June 2020 with the purpose of identifying / verifying land and soil characteristics.

The site walkover surveys encompassed the whole site area, with emphasis placed upon areas likely to be affected by proposed works in order to fully assess potential issues with regards to lands and soil:

5.2.3 Scoring Matrix for Impact Assessment

Impact assessment has been carried out with reference to the EPA's "Guidelines On The Information To Be Contained In Environmental Impact Assessment Reports (Draft August 2017)" & the TII "Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes".

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.

Receptor Sensitivity

- The sensitivity of the receiving environment has been categorised on a scale from "high" to "negligible" as defined in Table 5.3

. Sensitivity criteria has been based on:

- Vulnerability of a receptor to a particular pressure (degree of environmental response to any particular impact); and
- The 'value' of the receptor (e.g. an area of international importance should be considered more sensitive to the impact than an area of little or no conservation value).

Table 5.3: Receptor Sensitivity

Sensitivity of Environment	Criteria	Examples
High	Attribute has a high quality and rarity	Geological Feature rare on a regional or national scale (NHA) Large existing quarry / pit or landfill Active peat
Medium	Attribute has a medium quality and rarity	Geological Feature rare on a local scale (County Geological Site) Proven extractable resource rare on local level Well drained and Highly Fertile Soils
Low	Attribute has a low quality and rarity	Moderately drained and moderately fertile soils Small existing commercial quarry/pit/landfill
Negligible	Attribute resilient to environmental change	Poorly Drained and/or low fertility soils Common soils and bedrock

Impact Magnitude

The Impact Magnitude has been categorised on a scale from “high” to “negligible” as defined in Table 5.4.

Table 5.4 Impact Magnitude Criteria

Magnitude of Impact	Criteria	Examples (non-exhaustive)
High	Results in permanent loss of attribute	An impact that obliterates sensitive characteristics of the soil/geological feature
Medium	Results in temporary or minor impact to attribute and/or quality and integrity of attribute.	Impact on regional geological / soil characteristics
Low	Results in an impact on attribute but of insufficient magnitude to affect either use or integrity.	Local impacts to geological / soil characteristics not affecting overall integrity of receptor
Negligible	An Impact without measurable or noticeable consequences or	No measurable impacts on ground conditions

Factors which influence the Impact magnitude include the type of impact and duration. These aspects are considered in line with TII and EPA guidance below

Table 5.5 Types of Impact

Potential Impact	Description
Direct Impact	The existing geological, hydrological or hydrogeological environment is altered in whole or in part as a consequence of road construction or operations
Indirect Impact	The existing geological, hydrological or hydrogeological environment beyond the proposed route corridors is altered by activities related to road construction and/or operation
No predicted impact	The proposed route corridor has neither a negative nor a positive impact on the geological, hydrological or hydrogeological environment

Table 5.6 – Impact Duration (EPA 2017)

Duration	Description
Momentary	Lasting from seconds to minutes
Brief	Effects lasting less than a day
Temporary	Effects lasting less than a year
Short-Term	Effects lasting one to seven years.
Medium Term	Lasting seven to fifteen years.
Long Term	Lasting fifteen to sixty years.
Permanent	Lasting over sixty years
Reversible	Impacts that can be undone, for example through remediation or restoration

Impact Significance

The significance of the identified potential impacts is acknowledged by the combination of the magnitude of the potential impact and sensitivity of the receptor.

The generalised significance terms used in this assessment is in line with the EPA guidance reproduced in below

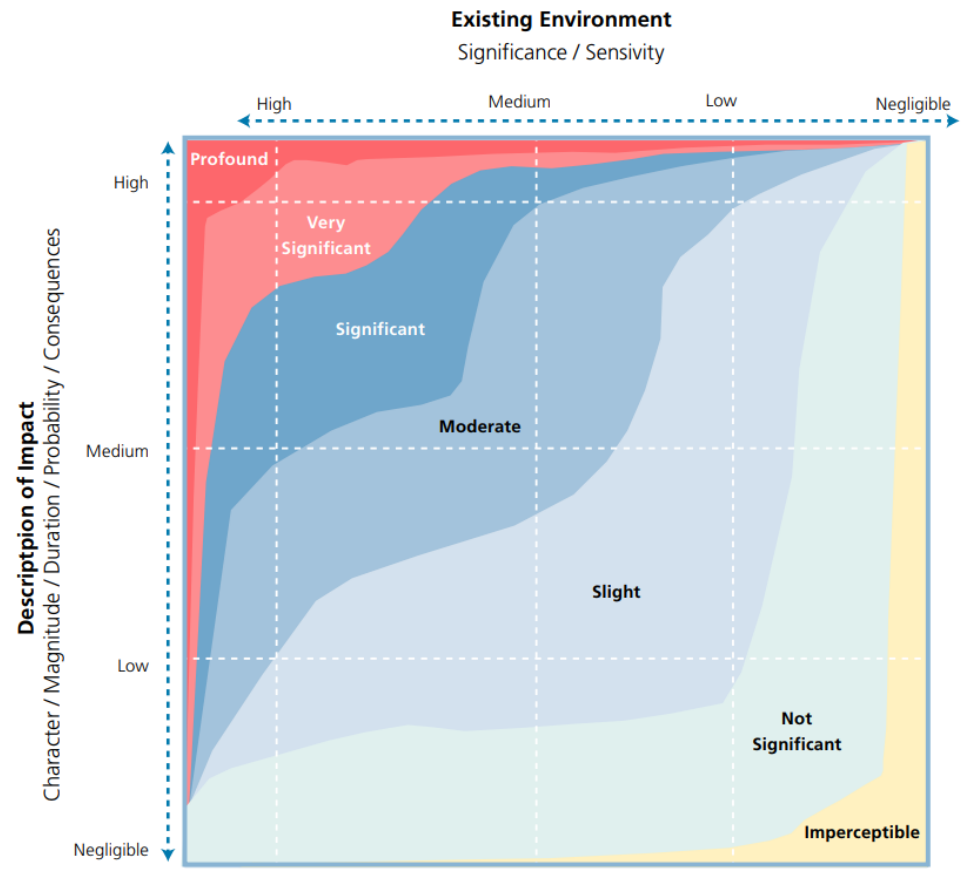


Figure 5-1: Significance Effect Matrix

In addition to significance, the effect on the receiving environment may be Positive, Neutral or Adverse.

5.3 Baseline Environment

5.3.1 Bedrock Geology

The 1:100,000 GSI bedrock Geology Map indicates that the Ballyhale Flood Relief Scheme is underlain in its majority by Kiltorcan Formation, while 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.

The County Kilkenny Groundwater Protection Scheme notes that the shales of the overlying Portersgate formation are less permeable and can act as a confining layer and artesian flows have been obtained where wells have breached them to tap into the Kiltorcan sandstones below.

An extract from GSI mapping is presented below

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.



Figure 5-2 Bedrock Geology

5.3.2 Superficial Geology (Soils)

The subsoils underlying the road route are comprised of variable sediments and thickness of Quaternary aged sediments. GSI Quaternary sediment mapping indicates the majority of the scheme to be underlain by till derived from limestones. It notes bedrock outcrops in areas south of the village and alluvium along some stream channels. An extract from GSI mapping is presented below.

Areas within the developed portion of the village are anticipated by be made ground and teagasc soil maps also indicates made ground here.

Generally site inspection showed good correlation with mapped data

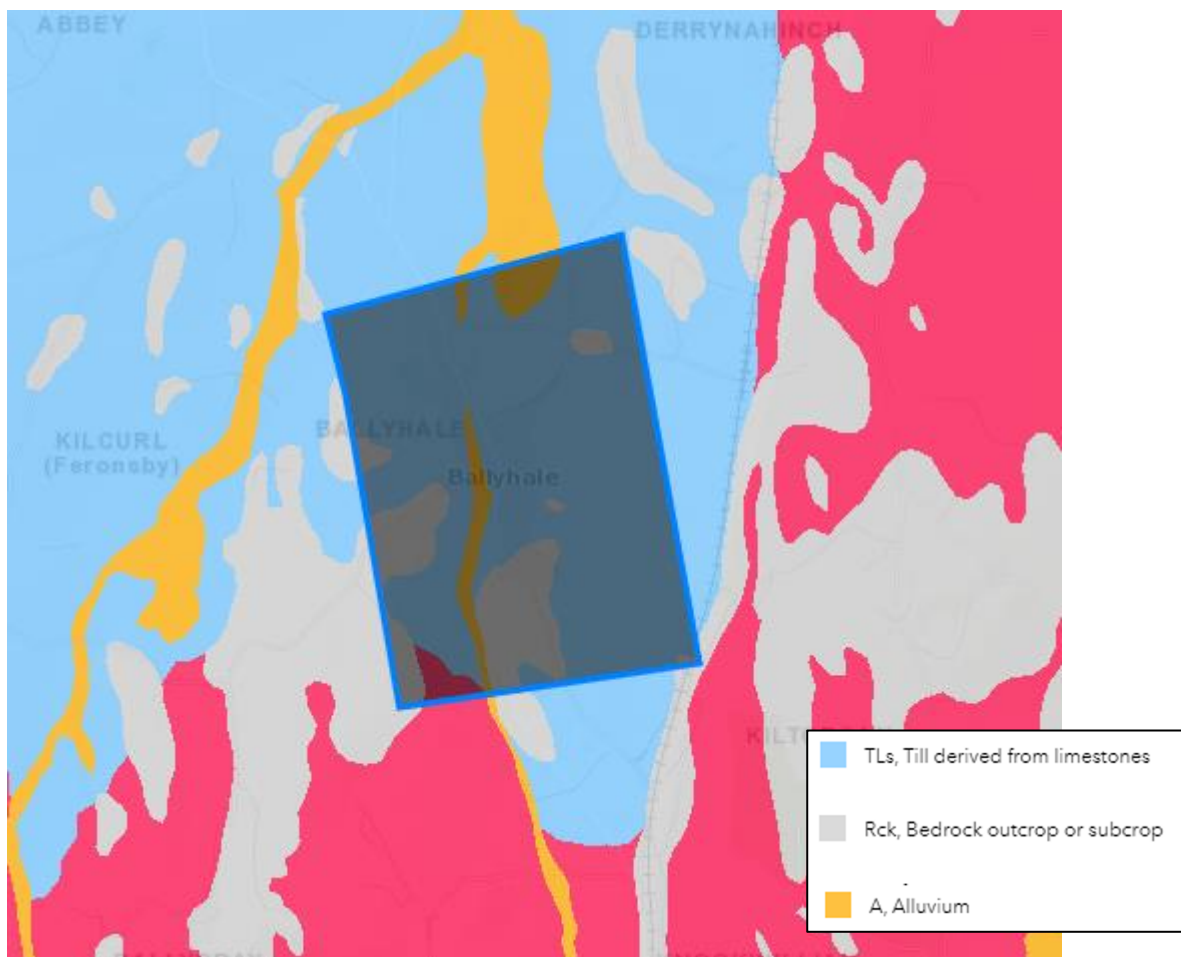


Figure 5-3: Quaternary Sediments

5.3.3 Contaminated Ground

No existing areas of contaminated ground have been identified within the route. Historical site uses do not appear to indicate heavy industrial use or contamination history. Site investigation would be carried out at detailed design phase which would include environmental testing .

5.3.4 Unstable Ground & Geohazards

The GSI holds a database of historical landslides in Ireland. No records in this database lie in the vicinity of the roads scheme

GSI groundwater Karst Data do not have any records of Karst features in the area.

There is no evidence in mapping or site investigation of significant peat deposits in the area.

5.3.5 Waste Facilities

The EPA holds database of waste facilities. No waste facility is located to the vicinity of the site.

5.3.6 Quarries / Mines

There are no active Quarries or mines affected by the proposed scheme.

5.3.7 Geological Heritage Sites

The GSI hold a database of Geological Heritage Sites. No heritage sites are within the proposed scheme extents. The closest identified sites are Kiltorcan New Quarry located 1Km east, Kiltorcan Old Quarry located 1.5 Km east and the Hugginstown M9 Cutting located 2.5Km west from the scheme.

5.3.8 Designated sites

Table 5.7 below details designated sites within 5km of the proposed scheme.

Table 5.7: Designated Sites

Station ID	Name	Designation	Distance	Commentary
002162	River Barrow and River Nore	Special Area of Conservation (SAC)	- km	<p>Freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and includes also the tidal elements and estuary as far downstream as Creadun Head in Waterford.</p> <p>Designation partially as a result of the presence of sensitive aquatic ecology such as the Freshwater Pearl Mussel and extremely rare Nore Freshwater Pearl Mussel.</p> <p>Site not considered sensitive to land and soil impacts at the site</p>
000839	Kilkeasy Bog	Proposed Natural Heritage Area	4.5 km	<p>Kilkeasy Bog is a large wetland area comprising small lakes, fen, wet grassland, cutover bog and heathland</p> <p>Site is a considerable distance from proposed works so is not considered sensitive to land and soil impacts at the site</p>
000404	Hugginstown Fen	SAC	4.5 km	<p>Area of swamp and floating fen developed in a small valley in hilly country. It is underlain by limestone glacial till overlying and surrounded by acid Old Red Sandstone. Designated based in alkaline fens.</p> <p>Site is a considerable distance from proposed works so is not considered sensitive to land and soil impacts at the site</p>

Based on the above review no designated sites are considered to be sensitive to soils/geological impacts at the subject site.

5.3.9 Baseline Summary and Sensitivities

The baseline assessment indicates a number of land & soils receptors that have the potential to demonstrate sensitivity to the development proposed at the site. These are:

- Soils/Subsoils ;
- Bedrock

Sensitivity of the receptors identified is determined in accordance with the rationale described in 'Determination of Magnitude and Significance Criteria'.

Table 5.8 Baseline Summary

Type	Receptor	Sensitivity	Rationale
Geological	Bedrock	Negligible	Resilient to significant change without effect to the overall receptor value
Geological	Soils / Subsoils	Low	Moderate Fertility moderately drained soils. Common soil type across Ireland

5.4 References

- Guidelines on Procedures for Assessment and Treatment of Geology, Hydrology and Hydrogeology for National Road Schemes (NRA, 2009);
- Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA, 2008);
- Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan (TII);
- The Management Of Waste From National Road Construction Projects (TII);
- Design of Earthworks Drainage, Network Drainage, Attenuation & Pollution Control (DN-DNG-03066) (TII);
- Guidelines On The Information To Be Contained In Environmental Impact Assessment Reports (Draft August 2017) (EPA);
- EPA Advice Notes on Current Practice (in the preparation of Environmental Impact Statements) Sept. 2003;
- Geo Portal (<https://gis.epa.ie/EPAMaps/>) (EPA);
- The SUDS Manual (CIRIA C753) (CIRIA);
- Control of Water Pollution from Construction Sites. Guidance for Consultants and Contractors (CIRIA C532);
- Control of Water Pollution from Linear Construction Sites (CIRIA C648);
- Environmental Good Practice on Site (C692) (2010) (CIRIA);
- Guidelines for Preparation of Soils, Geology & Hydrogeology Chapters in Environmental Impact Statements. (2013) Institute of Geologists of Ireland (IGI);
- Best Practice Guidelines on the Preparation of Waste Management Plans for Construction and Demolition Projects, Dept of the Environment Heritage and Local Government;
- Construction Code of Practice for the Sustainable Use of Soils on Construction Sites, Department for Environment, Food and Rural Affairs (UK); and
- Geological Survey Ireland Spatial Resources <https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228>

Preliminary Environmental Assessment, Aquatic Assessment and Habitat Map -
Identification of Ecological Issues in relation to Ballyhale Flood Relief Scheme.



18th November 2020

Submitted by: Altemar Ltd.
Submitted to: DBFL

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1 Introduction

Introduction

Kilkenny County Council has appointed DBFL Consulting Engineers to develop a sustainable flood relief scheme for Ballyhale (Figures 1 and 2). Altemar, Marine and Environmental Consultants has been retained to undertake a preliminary ecological appraisal report to assess the environmental considerations for a flood relief scheme for Ballyhale, Co. Kilkenny. The scheme is funded by the Office of Public Works (OPW).

The objective of this project is the identification, design and construction of a Flood Relief Scheme, that is technically, socially, environmentally and economically acceptable, to alleviate the risk of flooding to the Community of Ballyhale.

This Report includes a high-level assessment for five different routes for proposed flood relief options. The following report provides a preliminary site ecological assessment for the proposed works and follows the guidelines for Preliminary Ecological Appraisal outlined by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2013). The proposed development site is seen in Figures 1 and 2.

Scope of Service

This review included:

- Site visits (March 26th 2020 & 19th September 2020)
- Review available desktop data
- Identify any important environmental issues associated with the development
- For identified issues, identify the potential risks or impact on the project in terms of consents and licenses, potential timings, need for avoidance, mitigation, restrictions etc.
- As outlined by the CIEEM (Preliminary Ecological Appraisal)
 - is to establish baseline conditions and determine the importance of ecological features present (or those that could be present) within the specified area, as far as is possible;
 - is to establish any requirements for detailed/further surveys;
 - is to identify key constraints to the project and make recommendations for design options;
 - is to avoid significant effects on important ecological features/resources at an early stage;
 - is to identify the mitigation measures as far as possible, including those that will be required, and those that may be required (based on results of further surveys or final scheme design); and
 - is to identify enhancement opportunities.

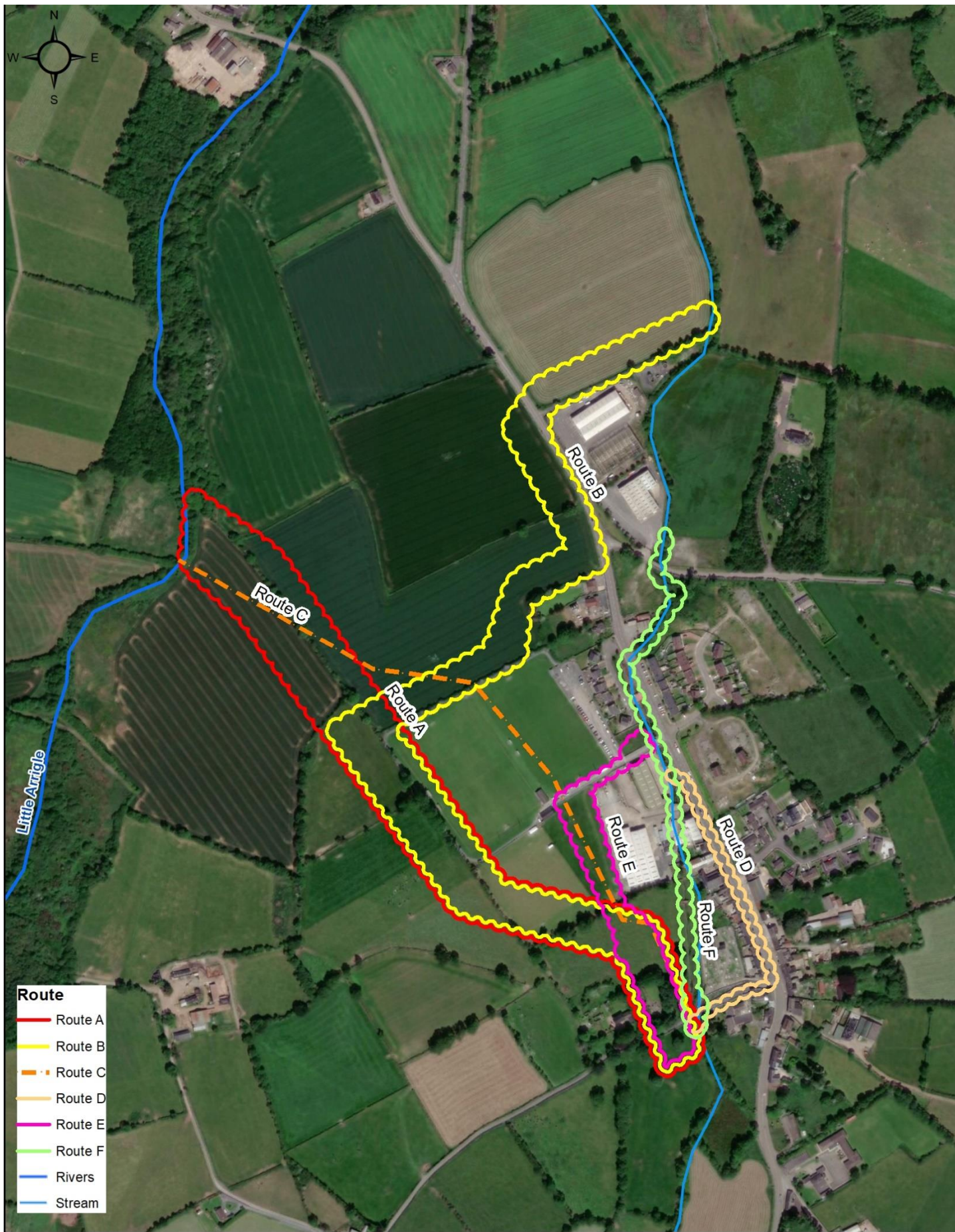
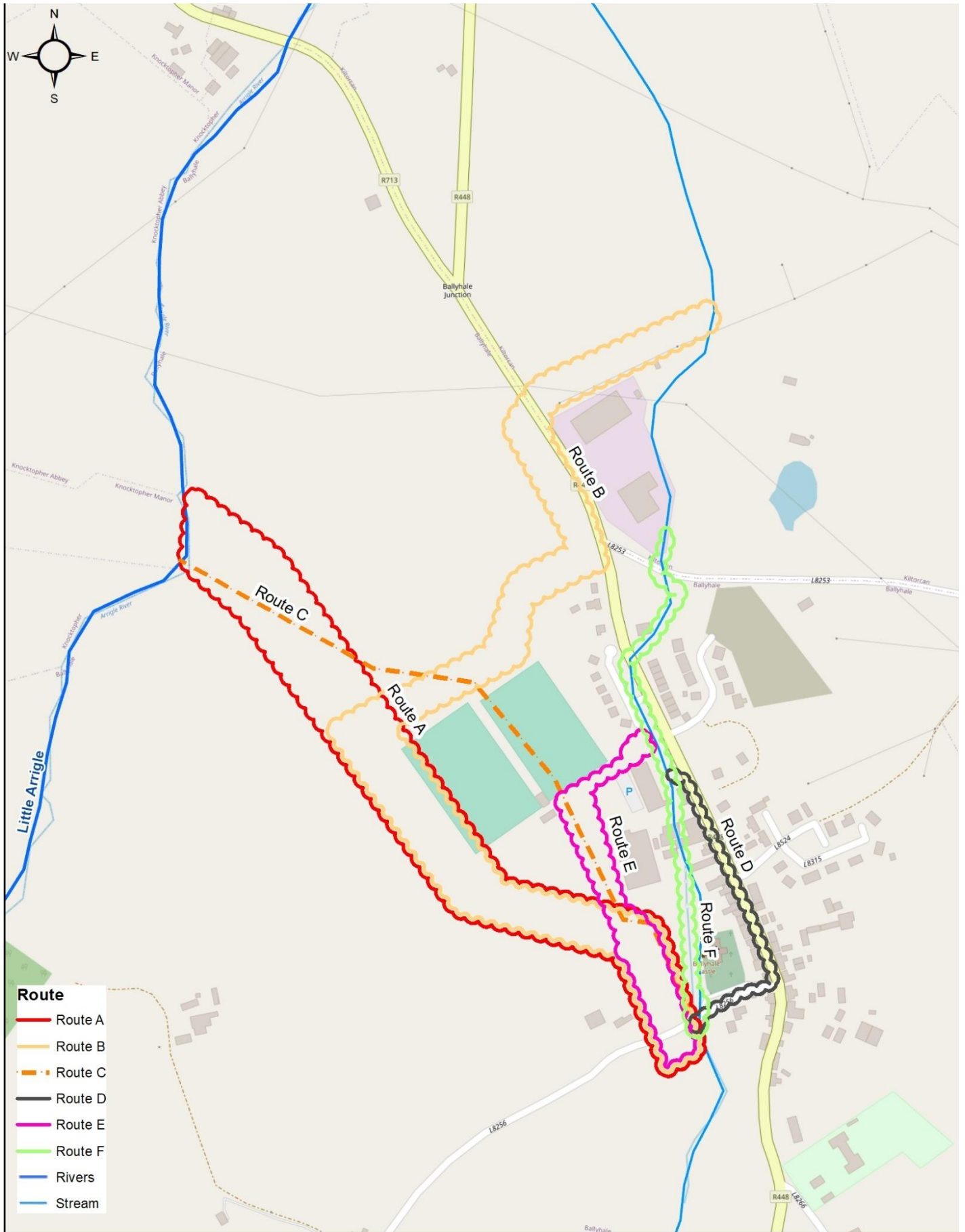


Figure 1. Proposed development site including concept scheme routes



ALTEMAR Project: Ballyhale
 Marine & Environmental Consultancy Date: 04/07/2020
 Drawn By: Bryan Deegan

0 25 50 100 150 200 Meters

Figure 2. Proposed development site including concept scheme routes

2 Results

Field Survey

Sufficient habitats and species were identified during the surveys (March & September 2020) to provide an understanding of the site, species present and the potential implications this may have on the biodiversity with the potential zone of influence.

Surveyor Information

The field survey was carried out by Bryan Deegan (MCIEEM.) Bryan holds a MSc in Environmental Science, BSc in Applied Marine Biology, Diploma in Applied Aquatic Science and has over 25 years practical fieldwork experience in terrestrial and aquatic habitats. Bryan founded Altemar in 2001 as an environmental consultancy working for State, Semi-State and private sector clients in the areas of environmental and aquatic consultancy.

3 Survey findings and evaluation

3.1 Desk study

The proposed works are proximate to and potentially within designated sites including Natura 2000 sites of international importance (Figures 3-7). The primary designated site proximate to/within or downstream of the proposed works is the River Barrow and River Nore SAC and there is a direct hydrological connection to this SAC. In addition, the River Nore SPA is 5km downstream of all instream works.

Data from the National Biodiversity Data Centre outlines species of importance within the 2km grid where the works are proposed are seen in Table 1. However, given the proximity of the River Barrow and Nore SAC to the proposed works it is likely that these data underestimate the aquatic species and the potential downstream impact on this SAC. It should be assumed that all the Features of this SAC are within or downstream of the works unless shown to be not the case. All Features of interest of this SAC are seen in Appendix I. However, particular attention should be made to potential impacts on the following which should be assumed to be present within the SAC near the works or have the potential to be impacted by the works:

- Water courses of plain to montane levels with the *Ranunculus fluitantis* and Callitricho-Batrachion vegetation [3260]
- Petrifying springs with tufa formation (Cratoneurion) [7220]
- Old sessile oak woods with Ilex and Blechnum in the British Isles [91A0]
- Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
- *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029]
- *Austropotamobius pallipes* (White-clawed Crayfish) [1092]
- *Petromyzon marinus* (Sea Lamprey) [1095]
- *Lampetra planeri* (Brook Lamprey) [1096]
- *Lampetra fluviatilis* (River Lamprey) [1099]
- *Alosa fallax fallax* (Twaiite Shad) [1103]
- *Salmo salar* (Salmon) [1106]
- *Lutra lutra* (Otter) [1355]
- *Margaritifera durrovensis* (Nore Pearl Mussel) [1990]

Table 1: Protected species noted within the site (NBDC Records).

Species name	Date of last record	Designation
Barn Swallow (<i>Hirundo rustica</i>)	16/04/2013	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Kestrel (<i>Falco tinnunculus</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Common Starling (<i>Sturnus vulgaris</i>)	23/05/2013	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
House Sparrow (<i>Passer domesticus</i>)	22/08/2013	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Spotted Flycatcher (<i>Muscicapa striata</i>)	31/12/2011	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Amber List
Yellowhammer (<i>Emberiza citrinella</i>)	28/08/2014	Protected Species: Wildlife Acts Threatened Species: Birds of Conservation Concern Threatened Species: Birds of Conservation Concern >> Birds of Conservation Concern - Red List
Japanese Knotweed (<i>Fallopia japonica</i>)	09/05/2012	Invasive Species: Invasive Species Invasive Species: Invasive Species >> High Impact Invasive Species Invasive Species: Invasive Species >> Regulation S.I. 477 (Ireland)
Eurasian Badger (<i>Meles meles</i>)	31/12/2004	Protected Species: Wildlife Acts
Lesser Noctule (<i>Nyctalus leisleri</i>)	03/06/2009	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts
Pipistrelle (<i>Pipistrellus pipistrellus sensu lato</i>)	03/06/2009	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts
Soprano Pipistrelle (<i>Pipistrellus pygmaeus</i>)	03/06/2009	Protected Species: EU Habitats Directive Protected Species: EU Habitats Directive >> Annex IV Protected Species: Wildlife Acts
West European Hedgehog (<i>Erinaceus europaeus</i>)	14/08/2012	Protected Species: Wildlife Acts

3.2 Field Study

Walkover assessments were carried out on the 26th March 2020 and the 19th September 2020. This involved a walkover of the site. Watercourses are mapped and shown in relation to the concept options in Figures 8-10. These watercourses are all upstream or within the River Barrow and River Nore SAC and numerous sensitive aquatic species are features of interest within this SAC. Treelines and hedgerows were mapped (Figure 11). The majority of the land is agricultural with a mixture of arable and grazing (cattle). The watercourses in figures 8-10 are indicative only and by looking at the satellite imagery many of the streams extend beyond the mapped watercourse areas. The following should be noted:

- 1) Habitats and species of conservation importance are possibly located within the site. The hedgerow and treeline areas may have terrestrial mammals. However, no breeding or resting places of conservation importance were noted during surveys. No flora of conservation importance were noted. The removal of existing treelines and hedgerows areas will result in a loss of biodiversity to the site. Bats may roost in these trees many of the trees or dwellings on site may contain potential roosting areas. Bats also forage along the larger treelines. Treelines would be slightly more important than hedgerows due to their larger landscape and biodiversity value. As the start of several of the diversion options there is a large group of trees. The potential impact on this area should be minimised and an arborist included within the team to provide input into the retention of these trees.
- 2) No species of conservation importance were noted within the terrestrial elements. However, a buzzard (*Buteo buteo*) was seen within the site and evidence of otter activity was noted by the river within the area of proposed route option C.
- 3) Several derelict/inhabited buildings are present on site and have bat roosting potential.

A high level ecological assessment of the 5 route options was carried out and is seen in Table 2. It is concluded that two routes are similar in relation to their moderate environmental impact while two routes have the potential for significant impacts. However, in terms of potential impact the potential impact on the River Barrow and River Nore SAC would be seen as the primary driver for significant biodiversity impacts, with additional impacts on hedgerows and treelines during construction. Routes through the developed areas connecting into the existing watercourse would be seen as having less impact on biodiversity while routes that connect directly to the SAC in a more western location have greater potential impacts on species and habitats of conservation importance. An additional risk would be the use of an open overflow style drainage ditch through cattle pastures where cattle have access to the drainage ditch. Infrequent flows have the potential to flush agricultural waste in to the SAC, so it would be advisable to restrict all routes to cattle by introducing fencing.

Invasive Species

It should be noted that no invasive plant or animal species listed under the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. 477 of 2011) Section 49, the Third Schedule: Part 1 Plants, Third Schedule: Part 2A Animals were noted during the surveys. As a result there are no terrestrial or aquatic species such as Japanese knotweed, giant rhubarb, Himalayan balsam, giant hogweed etc. that could hinder the works. However, prior to works commencing it is recommended that a revised survey is carried out.

Table 2. High level ecological assessment of the 5 route options

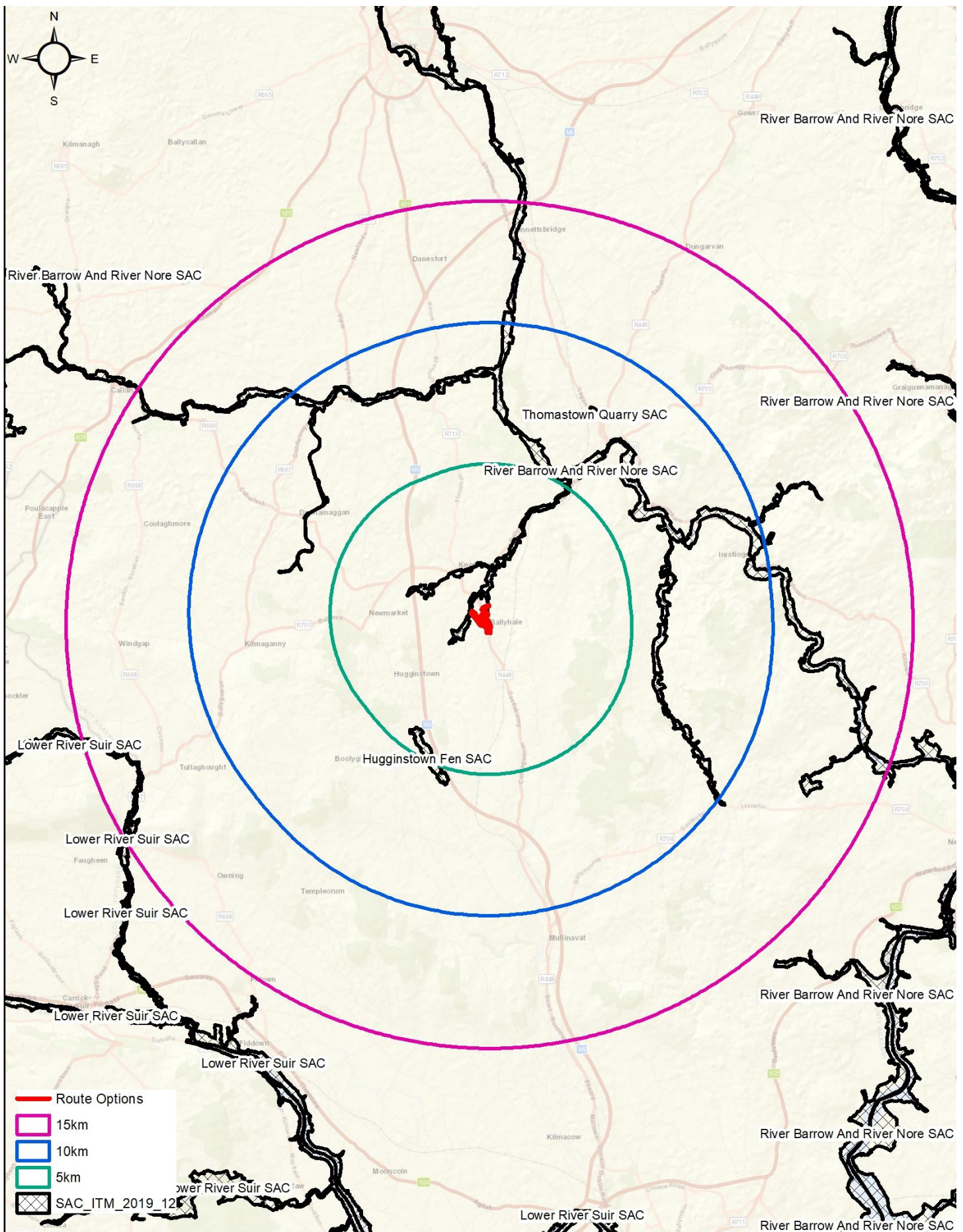
	Route A	Route B	Route C	Route D	Route E	Route F
Flora and Fauna	Route passes mainly through farmland with the potential loss of treelines and hedgerows. Of importance would be large trees at the start of the diversion. Evidence of Otter activity was noted along the Little Arrigle River where the diversion would discharge.	Route passes mainly through farmland with the potential loss of treelines and hedgerows. Of importance would be large trees at the start of the diversion. The diversion would discharge back into the Knock William stream.	Route passes mainly through farmland with the potential loss of treelines and hedgerows. Of importance would be large trees at the start of the diversion. Evidence of Otter activity was noted along the Little Arrigle River where the diversion would discharge.	Route passes mainly through existing roads with minimal impact on biodiversity. The diversion would discharge back into the Knock William stream.	Route passes mainly through farmland and road with the potential loss of treelines and hedgerows. Of importance would be large trees at the start of the diversion. The diversion would discharge back into the Knock William stream.	Route passes mainly through farmland but also roads and under buildings. It is assumed that this would involve a widening and deepening of the existing Knock William Stream with the potential loss of all instream biodiversity with potential for downstream impacts.
Conservation Sites	Nearest Natura 2000 site is River Barrow and River Nore SAC. The proposed route would enter and discharge to the River Barrow and River Nore SAC directly at the end of the diversion. Potentially impacted features of interest include Freshwater Pearl Mussel, White-clawed Crayfish, Sea Lamprey, Brook Lamprey, River Lamprey, Salmon, Otter, and the Nore Pearl Mussel.	Nearest Natura 2000 site is River Barrow and River Nore SAC. The proposed route would enter and discharge to the River Barrow and River Nore SAC directly at the end of the diversion. Potentially impacted features of interest include Freshwater Pearl Mussel, White-clawed Crayfish, Sea Lamprey, Brook Lamprey, River Lamprey, Salmon, Otter, and the Nore Pearl Mussel.	Nearest Natura 2000 site is River Barrow and River Nore SAC. The proposed route would enter and discharge to the River Barrow and River Nore SAC directly at the end of the diversion. Potentially impacted features of interest include Freshwater Pearl Mussel, White-clawed Crayfish, Sea Lamprey, Brook Lamprey, River Lamprey, Salmon, Otter, and the Nore Pearl Mussel.	Nearest Natura 2000 site is River Barrow and River Nore SAC. The proposed route would enter and discharge to the Knock William stream 200m upstream of the SAC. Potentially impacted features of interest include Freshwater Pearl Mussel, White-clawed Crayfish, Sea Lamprey, Brook Lamprey, River Lamprey, Salmon, Otter, and the Nore Pearl Mussel.	Nearest Natura 2000 site is River Barrow and River Nore SAC. The proposed route would enter and discharge to the Knock William stream 170m upstream of the SAC. Potentially impacted features of interest include Freshwater Pearl Mussel, White-clawed Crayfish, Sea Lamprey, Brook Lamprey, River Lamprey, Salmon, Otter, and the Nore Pearl Mussel.	Nearest Natura 2000 site is River Barrow and River Nore SAC. The proposed route is upstream and within the River Barrow and River Nore SAC directly at the end of the diversion. Potentially impacted features of interest include Freshwater Pearl Mussel, White-clawed Crayfish, Sea Lamprey, Brook Lamprey, River Lamprey, Salmon, Otter, and the Nore Pearl Mussel.
Conclusion	Potential impacts on SAC from works but also operation. Route passes through a livestock area. Infrequent use of the route could result in flushes of contamination entering the river if cattle had use of the route. Flows would increase within this part of the SAC during floods which could impact on the features of interest. If chosen it is recommended that the route is isolated from cattle and NPWS are consulted from an early stage due to potential of significant effects on the SAC. Loss of trees at the start of the diversion should be minimised.	If chosen it is recommended that the route is isolated from cattle as the route could result in flushes of contamination entering the stream. Slight preference to use this route due to similar max flows are maintained in the stream and areas are of relatively low biodiversity importance are crossed. Loss of trees at the start of the diversion should be minimised.	Potential impacts on SAC from works but also operation. Route passes through an arable area resulting in a loss of use of this land. It is assumed that this route would have no use in an arable fields and would need to be set aside for biodiversity. Flows would increase within this part of the SAC during floods which could impact on the features of interest. If chosen it is recommended that the route is isolated from cattle and NPWS are consulted from an early stage due to potential of significant effects on the SAC. Loss of trees at the start of the diversion should be minimised.	If this option is chosen there is less risk of contamination during construction and operation as it is assumed that this would be a sealed overflow culvert. There would also be less impacts on biodiversity during construction. Works could be done in isolation from watercourses minimising impacts during construction. An assessment of drainage from the street surface water would need to be carried out prior to construction to assess pathways.	If chosen it is recommended that the route is isolated from cattle as the route could result in flushes of contamination entering the stream. Slight preference to use this route due to similar max flows are maintained in the stream and areas are of relatively low biodiversity importance are crossed. Loss of trees at the start of the diversion should be minimised.	The disadvantage of this option is that all works will be upstream of the SAC and it will be difficult to isolate the works from the live watercourse. There is potential for significant downstream effects. It is recommended that a temporary diversion is put in place. However, it is more likely to involve a series of diversions and would have works in the river for a considerable amount of time compared to other options, particularly those that just involve connections at the start and end of the diversions.
Impact	Significant	Moderate	Significant	Slight	Moderate	Significant

4. Recommendations

1. A Natura Impact Statement will be required as all options have a direct pathway to Natura 2000 sites.
2. The tree loss may be high so the landscape should try to offset the loss with additional planting. Ideally the treelines and hedgerows retained by setting back sufficiently to allow for the diversions and retention of trees during construction. There will be a loss in biodiversity directly so mitigation measures will be needed to offset the loss e.g, bird/bat boxes etc.
3. The following remaining surveys are recommended:
 - a) Nesting bird survey (March-June) should significant areas of hedgerow or treelines be removed.
4. It is recommended that NPWS should be consulted at an early stage due to the potential impacts on the River Barrow and River Nore SAC, particularly if the proposed route involves works within or discharges directly to the SAC.(This has been carried out)
5. As the start of several of the diversion options there is a large group of trees. The potential impact on this area should be minimised and an arborist included within the team to provide input into the retention of these trees.
6. Fencing is used in all areas where cattle are proximate to the proposed routes to prevent contamination of the watercourses during flood events.
7. Discussions are ongoing with Inland Fisheries Ireland and these should continue to optimise the options and ensure minimal impact on aquatic biodiversity.

8. Conclusions

Based on the provisional site assessments many of the potential biodiversity issues noted on site can be mitigated and would not impact on the proposed development of the site. If mammals including bats were found within the trees, hedgerows or buildings it is likely that derogation licences would be granted and this would not inhibit or significantly delay the construction of the proposed development. In relation to the route assessments Route D would be the preferred route as this involves minimal impact on biodiversity. Besides these items the remainder of the impacts, including impacts on Flora and Fauna, appear, at high level assessment stage, to be similar in nature. Routes A and C would be the least favourable as it involves a complete change in the hydrodynamics where flushes enter the SAC in a new area and increases the volumes of water resulting in greater flows and scouring of potentially sensitive habitats and greater impacts on species.

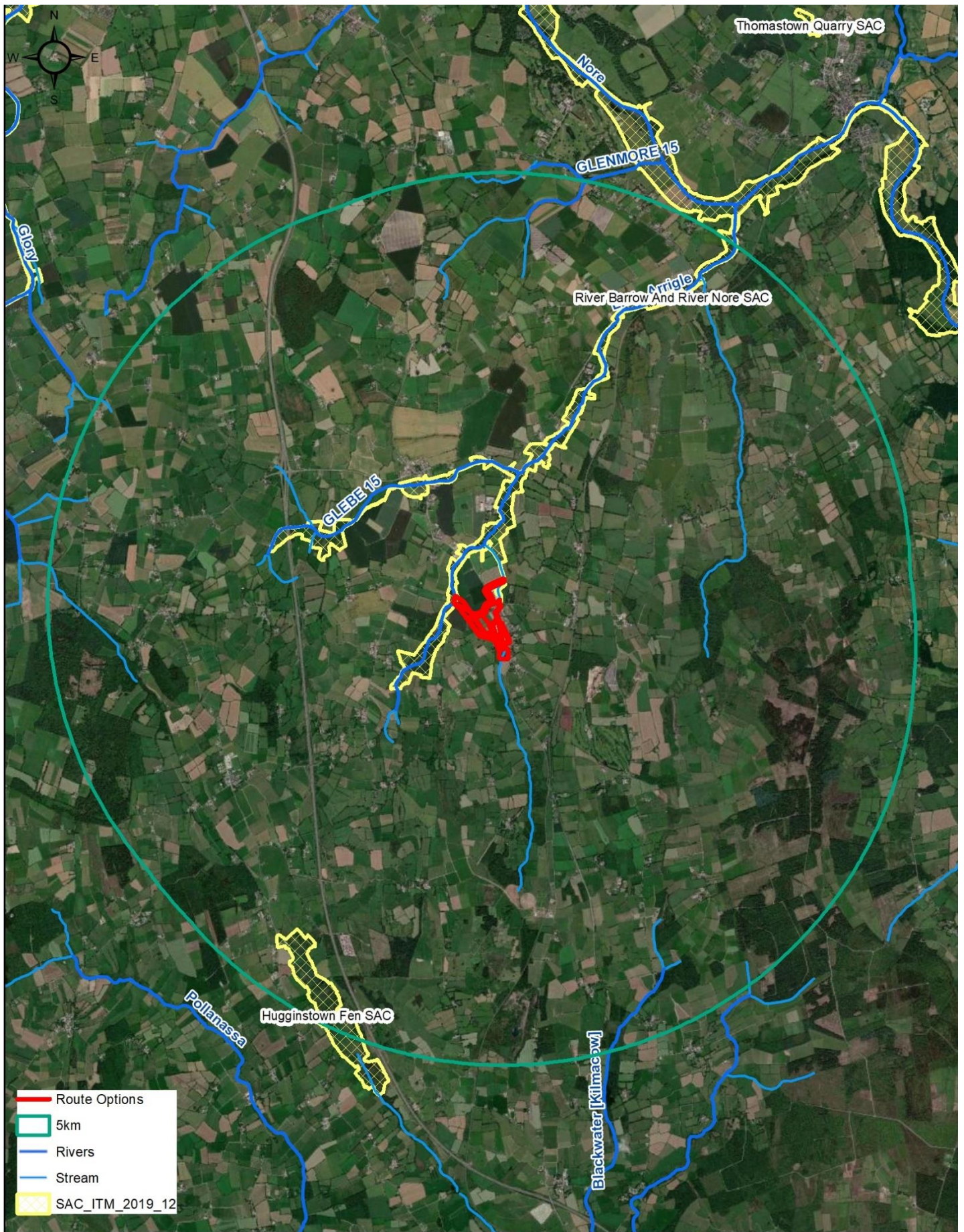


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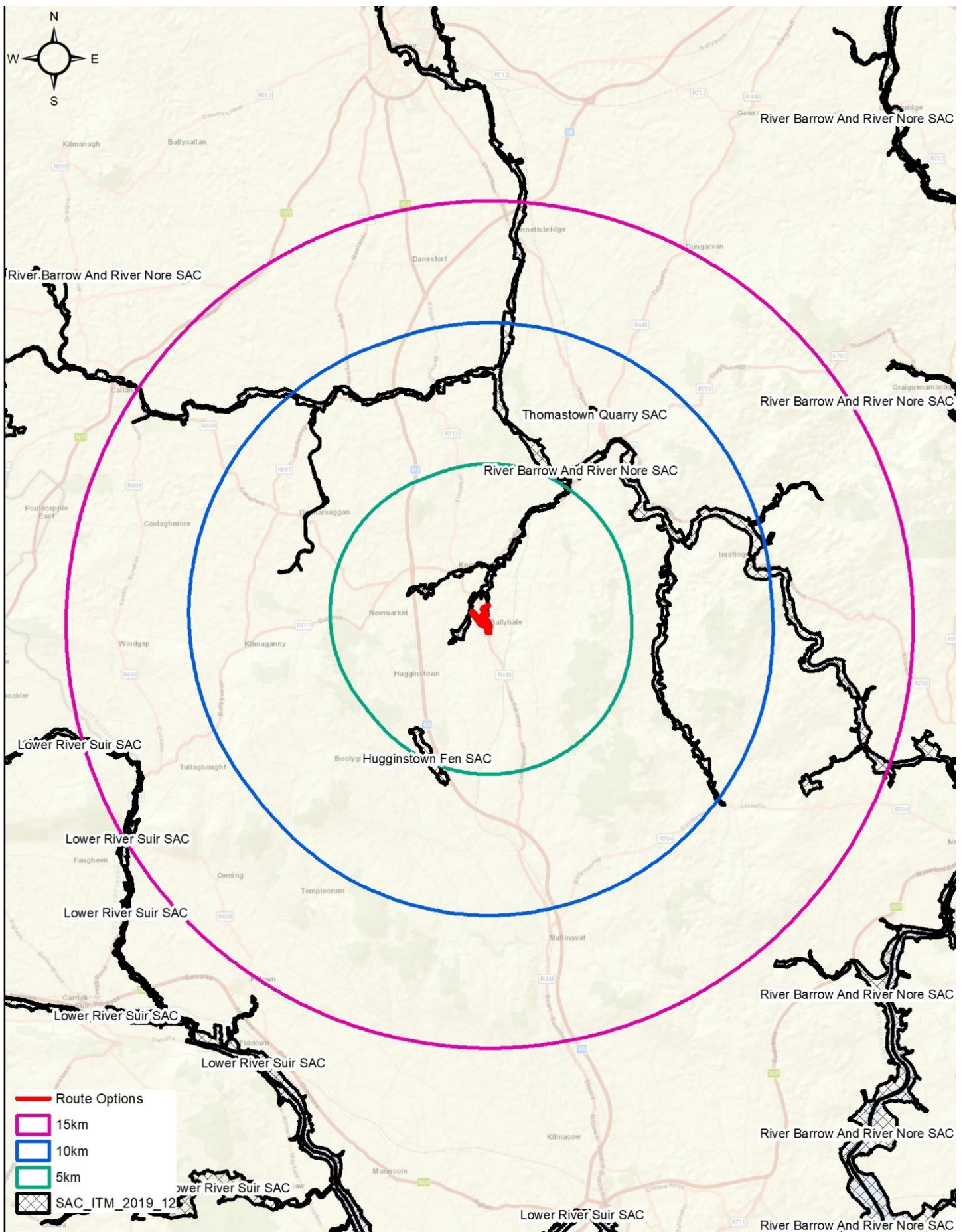
0 0.75 1.5 3 4.5 6 Kilometers

Figure 3. Special Areas of Conservation within 15km of the proposed development.



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Figure 4. Special Areas of Conservation and watercourses (rivers and streams) within 5km of the proposed development.

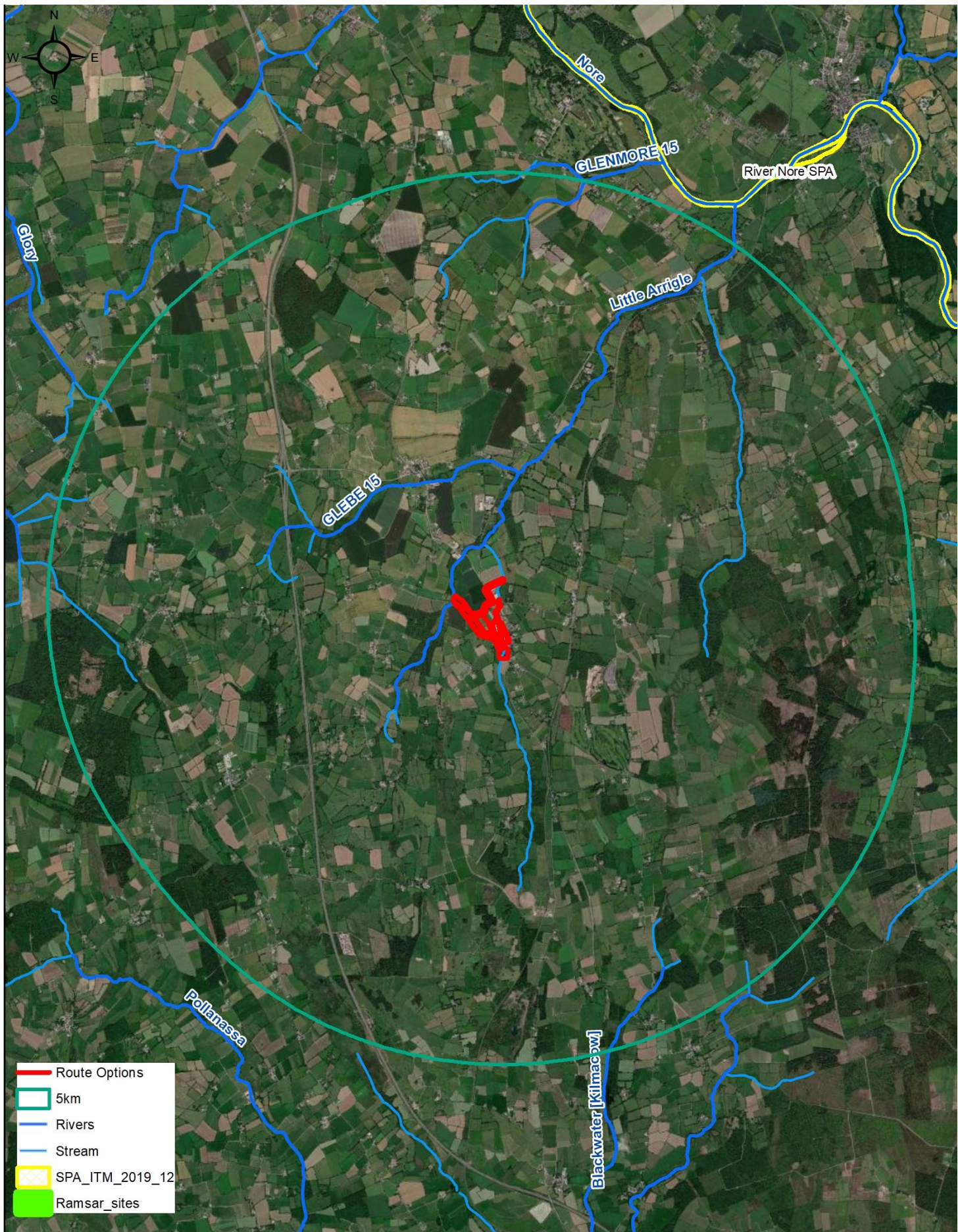


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Figure 5. Special Protection Areas in the vicinity of the proposed development.



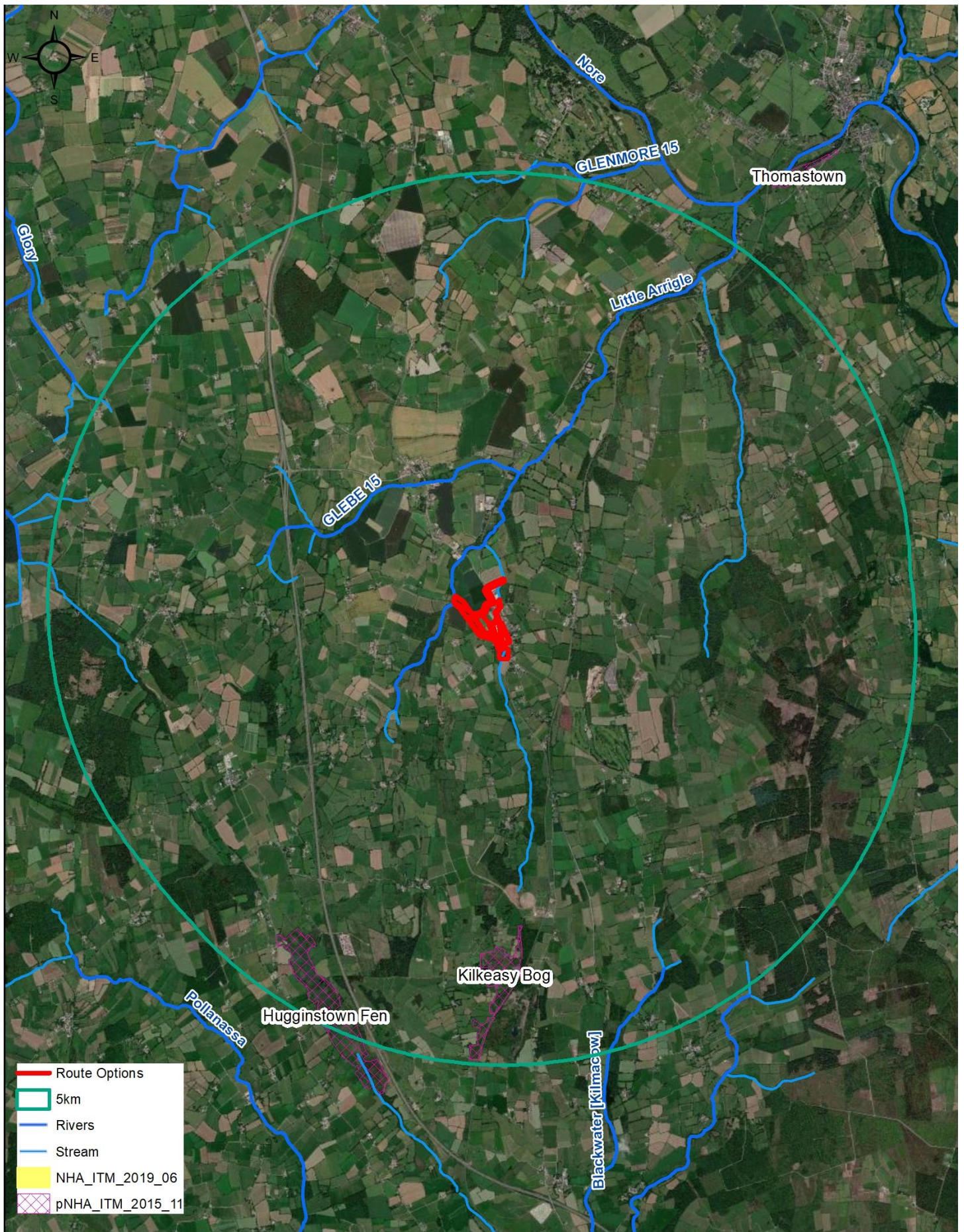
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Figure 6. Special Protection Areas and Ramsar sites in the vicinity of the proposed development.



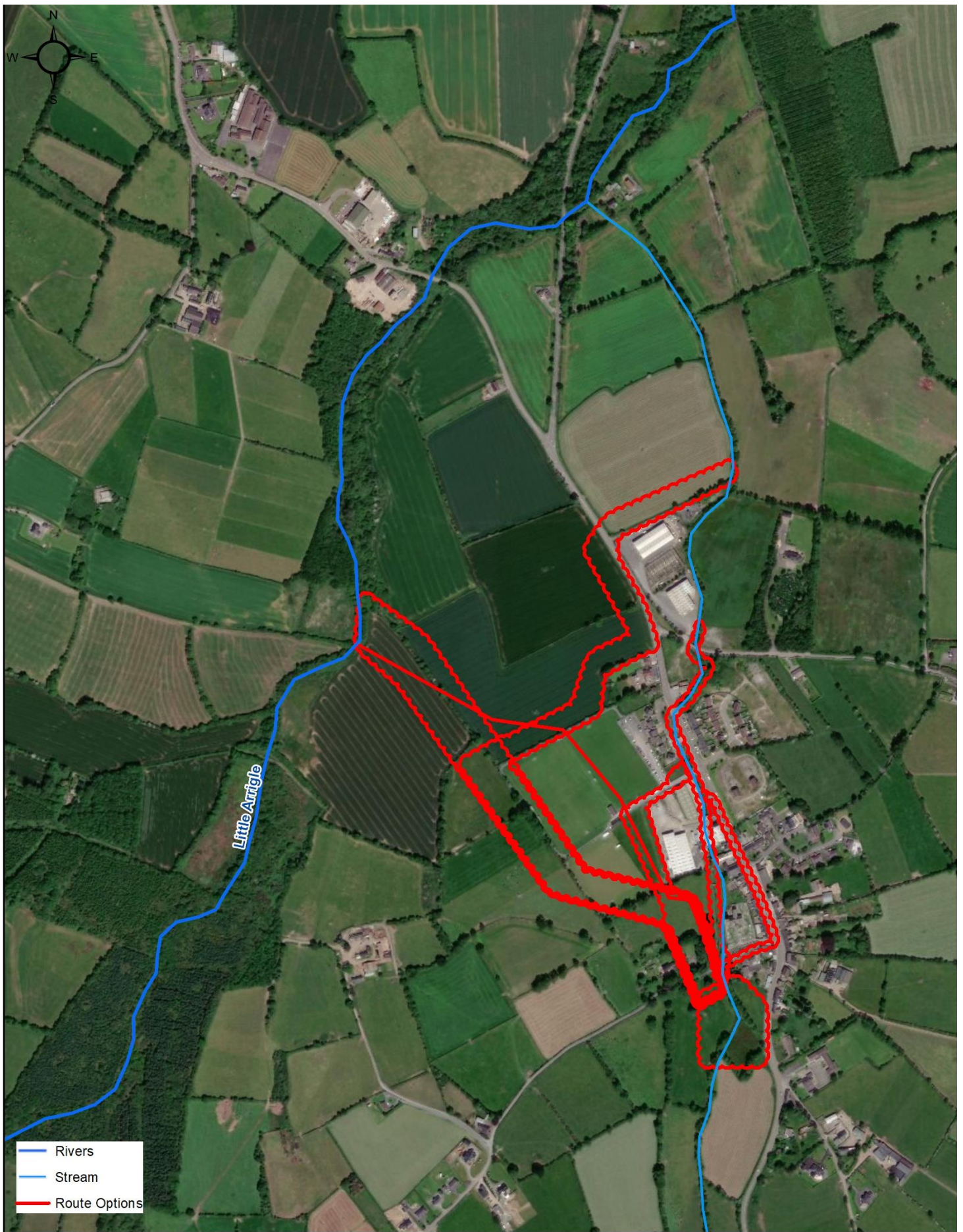
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Drawn By: Bryan Deegan

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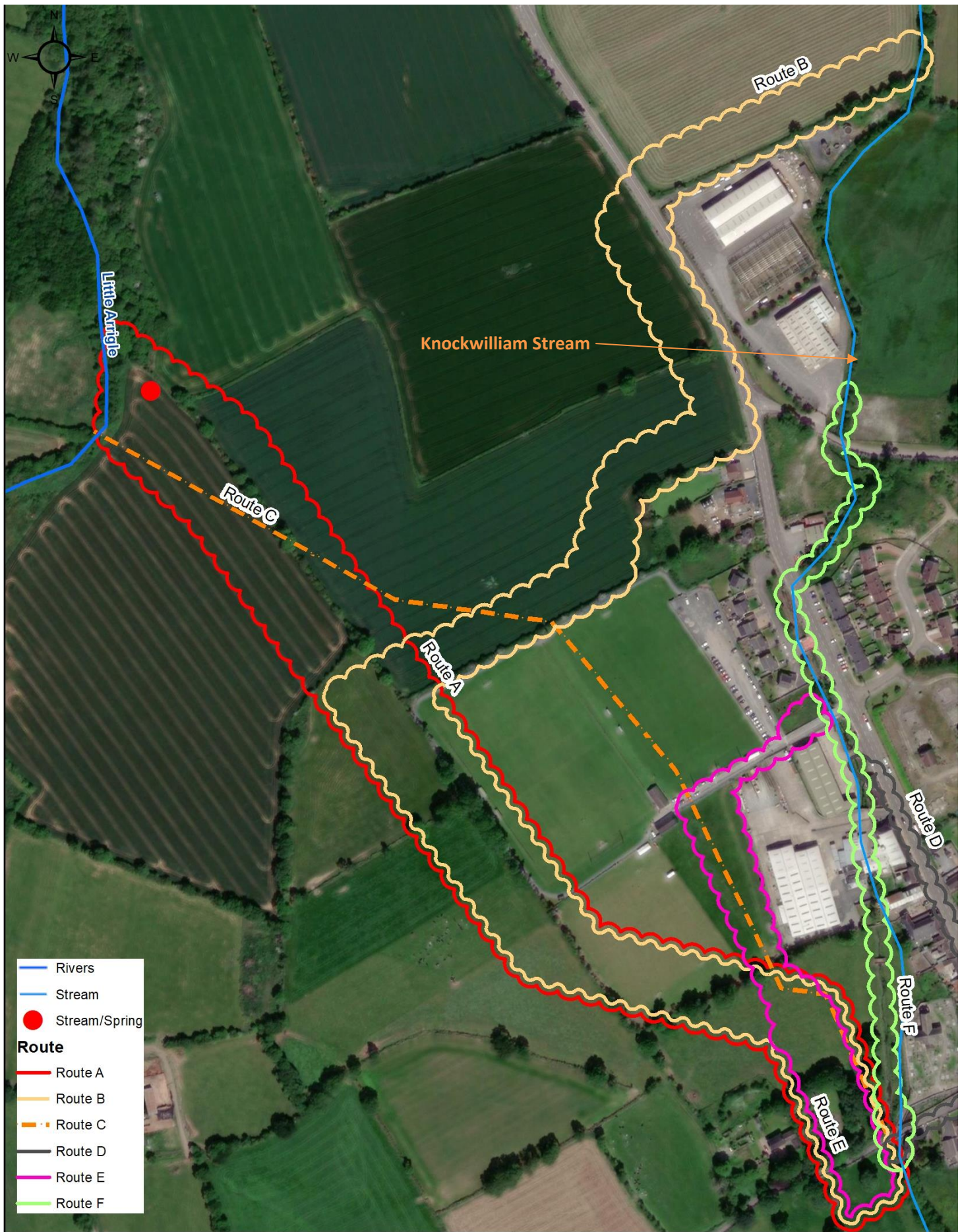


Figure 7. Natural Heritage Areas in the vicinity of the proposed development.



<p>ALTEMAR Marine & Environmental Consultancy</p>	<p>Project: Ballyhale Date: 04/07/2020 Drawn By: Bryan Deegan</p>	<p>0.03 0.07 0.14 0.21 0.28 Kilometers</p>	<p>Dublin IRELAND</p>
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Figure 8. Watercourses in the vicinity of the proposed development.



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Figure 9. Watercourses in the vicinity of the proposed development.

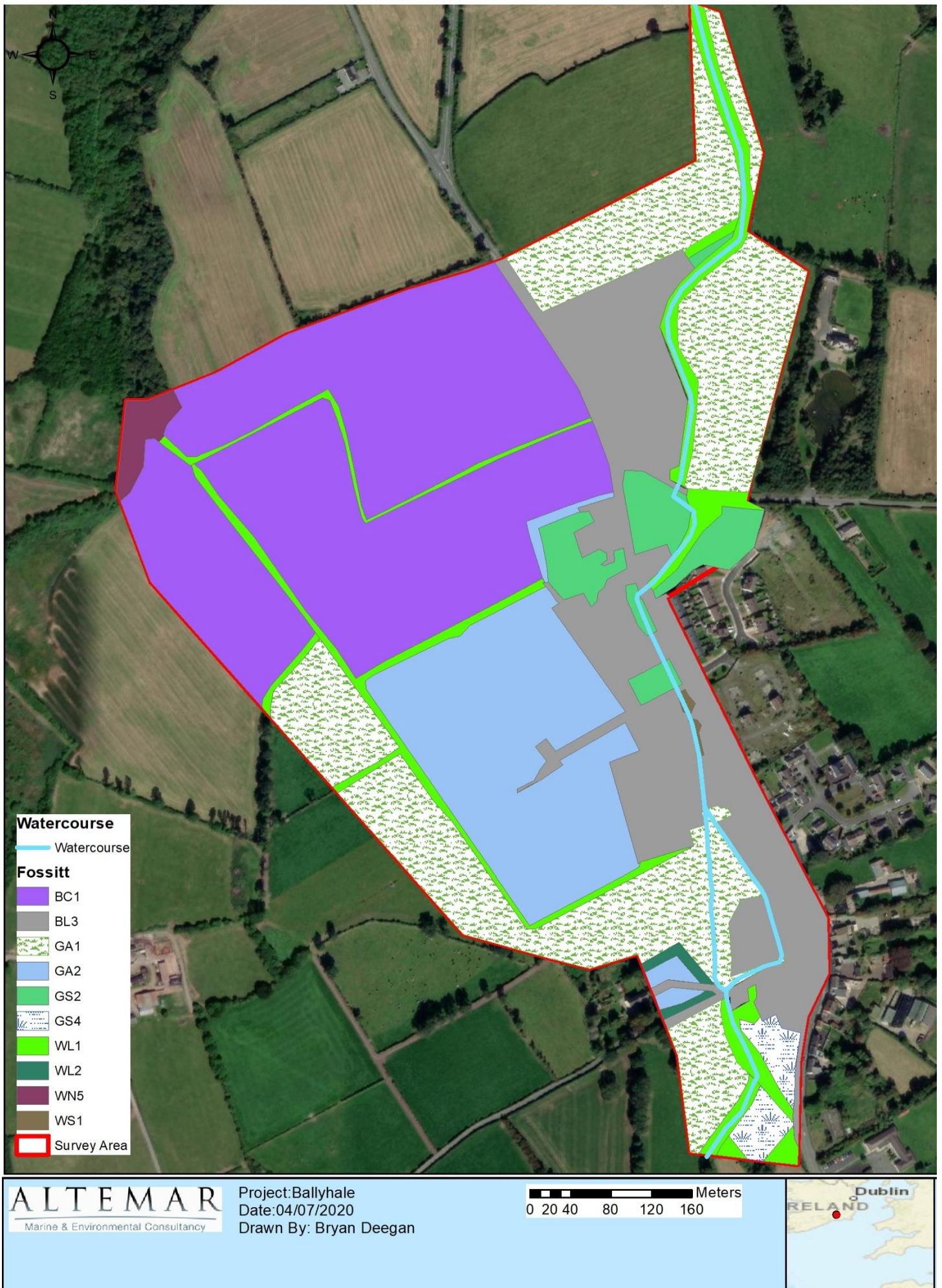


Figure 10. Fossitt Habitats

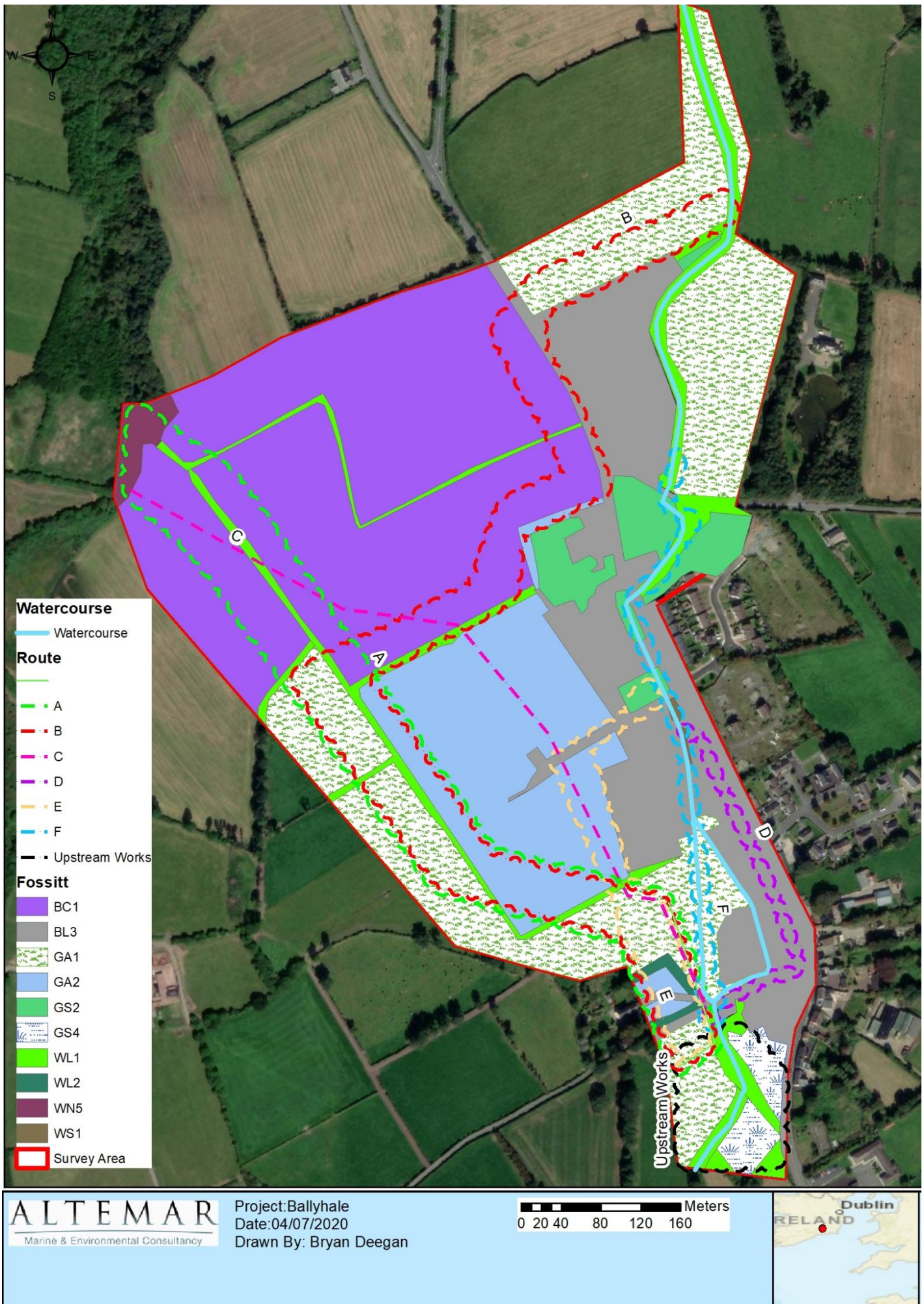


Figure 11. Fossitt Habitats and proposed routes.

Appendix I SITE SYNOPSIS River Barrow and River Nore SAC

Site Code: 002162

This site consists of the freshwater stretches of the Barrow and Nore River catchments as far upstream as the Slieve Bloom Mountains, and it also includes the tidal elements and estuary as far downstream as Creadun Head in Waterford. The site passes through eight counties – Offaly, Kildare, Laois, Carlow, Kilkenny, Tipperary, Wexford and Waterford. Major towns along the edge of the site include Mountmellick, Portarlinton, Monasterevin, Stradbally, Athy, Carlow, Leighlinbridge, Graiguenamanagh, New Ross, Inistioge, Thomastown, Callan, Bennettsbridge, Kilkenny and Durrow. The larger of the many tributaries include the Lerr, Fushoge, Mountain, Aughavaud, Owenass, Boherbaun and Stradbally Rivers of the Barrow, and the Delour, Dinin, Erkina, Owveg, Munster, Arrigle and King’s Rivers on the Nore. Both rivers rise in the Old Red Sandstone of the Slieve Bloom Mountains before passing through a band of Carboniferous shales and sandstones. The Nore, for a large part of its course, traverses limestone plains and then Old Red Sandstone for a short stretch below Thomastown. Before joining the Barrow it runs over intrusive rocks poor in silica. The upper reaches of the Barrow also run through limestone. The middle reaches and many of the eastern tributaries, sourced in the Blackstairs Mountains, run through Leinster Granite. The southern end, like the Nore runs over intrusive rocks poor in silica. Waterford Harbour is a deep valley excavated by glacial floodwaters when the sea level was lower than today. The coast shelves quite rapidly along much of the shore. The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

- [1130] Estuaries
- [1140] Tidal Mudflats and Sandflats
- [1170] Reefs [1310] Salicornia Mud
- [1330] Atlantic Salt Meadows
- [1410] Mediterranean Salt Meadows
- [3260] Floating River Vegetation
- [4030] Dry Heath
- [6430] Hydrophilous Tall Herb Communities
- [7220] Petrifying Springs
- *[91A0] Old Oak Woodlands
- [91E0] Alluvial Forests*
- [1016] Desmoulin's Whorl Snail (*Vertigo moulinsiana*)
- [1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)
- [1092] White-clawed Crayfish (*Austropotamobius pallipes*)
- [1095] Sea Lamprey (*Petromyzon marinus*)
- [1096] Brook Lamprey (*Lampetra planeri*)
- [1099] River Lamprey (*Lampetra fluviatilis*)
- [1103] Twaité Shad (*Alosa fallax*)
- [1106] Atlantic Salmon (*Salmo salar*)
- [1355] Otter (*Lutra lutra*)
- [1421] Killarney Fern (*Trichomanes speciosum*)
- [1990] Nore Freshwater Pearl Mussel (*Margaritifera durrovensis*)

Good examples of alluvial forest (a priority habitat on Annex I of the E.U. Habitats Directive) are seen at Rathsnagadan, Murphy’s of the River, in Abbeyleix estate and along other shorter stretches of both the tidal and freshwater elements of the site. Typical species seen include Almond Willow (*Salix triandra*), White Willow (*S. alba*), Rusty Willow (*S. cinerea* subsp. *oleifolia*), Crack Willow (*S. fragilis*) and Osier (*S. viminalis*), along with Iris (*Iris pseudacorus*), Hemlock Water-dropwort (*Oenanthe crocata*), Wild Angelica (*Angelica sylvestris*), Thin-spiked Wood-sedge (*Carex strigosa*), Pendulous Sedge (*C. pendula*), Meadowsweet (*Filipendula ulmaria*), Common Valerian (*Valeriana officinalis*) and the Red Data Book species Nettle-leaved Bellflower (*Campanula trachelium*). A good example of petrifying springs with tufa formations occurs at Dysart Wood along the Nore. This is a rare habitat in Ireland and one listed with priority status on Annex I of the E.U. Habitats Directive. These hard water springs are characterised by lime encrustations, often associated with small waterfalls. A rich bryophyte flora is typical of the habitat and two diagnostic species, *Palustriella commutata* and *Eucladium verticillatum*, have been recorded. The best examples of old oak woodlands are seen in the ancient Park Hill woodland in the estate at Abbeyleix; at Kyleadahir, on the Delour, Forest Wood House, Kylecorragh and Brownstown Woods on the Nore; and at Cloghristic Wood, Drummond

Wood and Borris Demesne on the Barrow, though other patches occur throughout the site. Abbeyleix Woods is a large tract of mixed deciduous woodland which is one of the only remaining true ancient woodlands in Ireland. Historical records show that Park Hill has been continuously wooded since the 16th century and has the most complete written record of any woodland in the country. It supports a variety of woodland habitats and an exceptional diversity of species including 22 native trees, 44 bryophytes and 92 lichens. It also contains eight indicator species of ancient woodlands. Park Hill is also the site of two rare plants, Nettle-leaved Bellflower and the moss *Leucodon sciuroides*. The rare Myxomycete fungus, *Licea minima* has been recorded from woodland at Abbeyleix. Oak woodland covers parts of the valley side south of Woodstock and is well developed at Brownsford where the Nore takes several sharp bends. The steep valley side is covered by oak (*Quercus* spp.), Holly (*Ilex aquifolium*), Hazel (*Corylus avellana*) and Downy Birch (*Betula pubescens*), with some Beech (*Fagus sylvatica*) and Ash (*Fraxinus excelsior*). All the trees are regenerating through a cover of Bramble (*Rubus fruticosus* agg.), Foxglove (*Digitalis purpurea*), Great Wood-rush (*Luzula sylvatica*) and Broad Buckler-fern (*Dryopteris dilatata*). On the steeply sloping banks of the River Nore, about 5 km west of New Ross, in Co. Kilkenny, Kylecorragh Woods form a prominent feature in the landscape. This is an excellent example of relatively undisturbed, relict oak woodland with a very good tree canopy. The wood is quite damp and there is a rich and varied ground flora. At Brownstown, a small, mature oak dominated woodland occurs on a steep slope. There is younger woodland to the north and east of it. Regeneration throughout is evident. The understorey is similar to the woods at Brownsford. The ground flora of this woodland is developed on acidic, brown earth type soil and comprises a thick carpet of Bilberry (*Vaccinium myrtillus*), Heather (*Calluna vulgaris*), Hard Fern (*Blechnum spicant*), Common Cow-wheat (*Melampyrum pratense*) and Bracken (*Pteridium aquilinum*). Borris Demesne contains a very good example of a semi-natural broadleaved woodland in very good condition. There is quite a high degree of natural re-generation of oak and Ash through the woodland. At the northern end of the estate oak species predominate. Drummond Wood, also on the Barrow, consists of three blocks of deciduous woods situated on steep slopes above the river. The deciduous trees are mostly oak species. The woods have a well-established understorey of Holly, and the herb layer is varied, with Bramble abundant. The whitebeam *Sorbus devoniensis* has also been recorded here. Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the floodplain of the river is intact. Characteristic species of the habitat include Meadowsweet, Purple Loosestrife (*Lythrum salicaria*), Marsh Ragwort (*Senecio aquaticus*), Ground Ivy (*Glechoma hederacea*) and Hedge Bindweed (*Calystegia sepium*). Indian Balsam (*Impatiens glandulifera*), an introduced and invasive species, is abundant in places. Floating river vegetation is well represented in the Barrow and in the many tributaries of the site. In the Barrow the species found include water-s tarworts (*Callitriche* spp.), Canadian Pondweed (*Elodea canadensis*), Bulbous Rush (*Juncus bulbosus*), water-milfoils (*Myriophyllum* spp.), the pondweed *Potamogeton x nitens*, Broad-leaved Pondweed (*P. natans*), Fennel Pondweed (*P. pectinatus*), Perfoliated Pondweed (*P. perfoliatus*) and crowfoots (*Ranunculus* spp.). The water quality of the Barrow has improved since the vegetation survey was carried out (EPA, 1996).

Dry heath at the site occurs in pockets along the steep valley sides of the rivers especially in the Barrow Valley and along the Barrow tributaries where they occur in the foothills of the Blackstairs Mountains. The dry heath vegetation along the slopes of the river bank consists of Bracken and Gorse (*Ulex europaeus*) with patches of acidic grassland vegetation. Additional typical species include Heath Bedstraw (*Galium saxatile*), Foxglove, Common Sorrel (*Rumex acetosa*) and Creeping Bent (*Agrostis stolonifera*). On the steep slopes above New Ross the Red Data Book species Greater Broomrape (*Orobanchae rapum-genistae*) has been recorded. Where rocky outcrops are shown on the maps Bilberry and Great Wood-rush are present. At Ballyhack a small area of dry heath is interspersed with patches of lowland dry grassland. These support a number of clover species, including the legally protected Clustered Clover (*Trifolium glomeratum*) - a species known from only one other site in Ireland. This grassland community is especially well developed on the west side of the mud-capped walls by the road. On the east of the cliffs a group of rock-dwelling species occur, i.e. English Stonecrop (*Sedum anglicum*), Sheep's-bit (*Jasione montana*) and Wild Madder (*Rubia peregrina*). These rocks also support good lichen and moss assemblages with Ramalina subfarinacea and Hedwigia ciliata. Dry heath at the site generally grades into wet woodland or wet swamp vegetation lower down the slopes on the river bank. Close to the Blackstairs Mountains, in the foothills associated with the Aughnabriskey, Aughavaud and Mountain Rivers there are small patches of wet heath dominated by Purple Moor-grass (*Molinia caerulea*) with Heather, Tormentil (*Potentilla erecta*), Carnation Sedge (*Carex panicea*) and Bell Heather (*Erica cinerea*). Salt meadows occur at the southern section of the site in old meadows where the embankment has been breached, along the tidal stretches of in-flowing rivers below Stokestown House, in a narrow band on

the channel side of Common Reed (*Phragmites australis*) beds and in narrow fragmented strips along the open shoreline. In the larger areas of salt meadow, notably at Carrickcloney, Ballinlaw Ferry and Rochestown on the west bank; Fisherstown, Alderton and Great Island to Dunbrody on the east bank, the Atlantic and Mediterranean sub types are generally intermixed. At the upper edge of the salt meadow in the narrow ecotonal areas bordering the grasslands where there is significant percolation of salt water, the legally protected species Borrer's Saltmarsh-grass (*Puccinellia fasciculata*) and Meadow Barley (*Hordeum secalinum*) are found. The very rare and also legally protected Divided Sedge (*Carex divisa*) is also found. Sea Rush (*Juncus maritimus*) is also present. Other plants recorded and associated with salt meadows include Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea Couch (*Elymus pycnanthus*), Spear-leaved Orache (*Atriplex prostrata*), Lesser Sea-spurrey (*Spergularia marina*), Sea Arrowgrass (*Triglochin maritima*) and Sea Plantain (*Plantago maritima*). Glassworts (*Salicornia* spp.) and other annuals colonising mud and sand are found in the creeks of the saltmarshes and at the seaward edges of them. The habitat also occurs in small amounts on some stretches of the shore free of stones.

The estuary and the other E.U. Habitats Directive Annex I habitats within it form a large component of the site. Extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. Good quality intertidal sand and mudflats have developed on a linear shelf on the western side of Waterford Harbour, extending for over 6 km from north to south between Passage East and Creadaun Head, and in places are over 1 km wide. The sediments are mostly firm sands, though grade into muddy sands towards the upper shore. They have a typical macro-invertebrate fauna, characterised by polychaetes and bivalves. Common species include *Arenicola marina*, *Nephtys hombergii*, *Scoloplos armiger*, *Lanice conchilega* and *Cerastoderma edule*. An extensive area of honey-comb worm biogenic reef occurs adjacent to Duncannon, Co. Wexford on the eastern shore of the estuary. It is formed by the polychaete worm *Sabellaria alveolata*. This intertidal *Sabellaria alveolata* reef is formed as a sheet of interlocking tubes over a considerable area of exposed bedrock. This polychaete species constructs tubes, composed of aggregated sand grains, in tightly packed masses with a distinctive honeycomb-like appearance. These can be up to 25cm proud of the substrate and form hummocks, sheets or more massive formations. A range of species are reported from these reefs including: *Enteromorpha* sp.; *Ulva* sp.; *Fucus vesiculosus*; *Fucus serratus*; *Polysiphonia* sp.; *Chondrus crispus*; *Palmaria palmate*; *Coralinus officinalis*; *Nemertea* sp.; *Actinia equine*; *Patella vulgate*; *Littorina littorea*; *Littorina obtusata* and *Mytilus edulis*. The western shore of the harbour is generally stony and backed by low cliffs of glacial drift. At Woodstown there is a sandy beach, now much influenced by recreation pressure and erosion. Behind it a lagoonal marsh has been impounded which runs westwards from Gaultiere Lodge along the course of a slow stream. An extensive reedbed occurs here. At the edges is a tall fen dominated by sedges (*Carex* spp.), Meadowsweet, willowherbs (*Epilobium* spp.) and rushes (*Juncus* spp.). Wet woodland also occurs. The dunes which fringe the strand at Duncannon are dominated by Marram (*Ammophila arenaria*) towards the sea. Other species present include Wild Clary/Sage (*Salvia verbenaca*), a rare Red Data Book species. The rocks around Duncannon ford have a rich flora of seaweeds typical of a moderately exposed shore and the cliffs themselves support a number of coastal species on ledges, including Thrift, Rock Samphire (*Crithmum maritimum*) and Buck's-horn Plantain (*Plantago coronopus*). Other habitats which occur throughout the site include wet grassland, marsh, reedswamp, improved grassland, arable land, quarries, coniferous plantations, deciduous woodland, scrub and ponds. Seventeen Red Data Book plant species have been recorded within the site, most in the recent past. These are Killarney Fern (*Trichomanes speciosum*), Divided Sedge, Clustered Clover, Basil Thyme (*Acinos arvensis*), Red Hemp-nettle (*Galeopsis angustifolia*), Borrer's Saltmarsh-grass, Meadow Barley, Opposite-leaved Pondweed (*Groenlandia densa*), Meadow Saffron/Autumn Crocus (*Colchicum autumnale*), Wild Clary/Sage, Nettle-leaved Bellflower, Saw-wort (*Serratula tinctoria*), Bird Cherry (*Prunus padus*), Blue Fleabane (*Erigeron acer*), Fly Orchid (*Ophrys insectifera*), Ivy Broomrape (*Orobanche hederaceae*) and Greater Broomrape. Of these, the first nine are protected under the Flora (Protection) Order, 2015. Divided Sedge was thought to be extinct but has been found in a few locations in the site since 1990. In addition plants which do not have a very wide distribution in the country are found in the site including Thin-spiked Wood-sedge, Field Garlic (*Allium oleraceum*) and Summer Snowflake. Six rare lichens, indicators of ancient woodland, are found including *Lobaria laetevirens* and *L. pulmonaria*. The rare moss *Leucodon sciuroides* also occurs. The site is very important for the presence of a number of E.U. Habitats Directive Annex II animal species including Freshwater Pearl Mussel (both *Margaritifera margaritifera* and *M. m. durrovensis*), White-clawed Crayfish, Salmon, Twaite Shad, three lamprey species – Sea Lamprey, Brook Lamprey and River Lamprey, the tiny whorl snail *Vertigo moulinsiana* and Otter. This is the only site in the world for the hard water form of the Freshwater Pearl Mussel, *M. m. durrovensis*, and one of only a handful of spawning grounds in the country for Twaite

Shad. The freshwater stretches of the River Nore main channel is a designated salmonid river. The Barrow/Nore is mainly a grilse fishery though spring salmon fishing is good in the vicinity of Thomastown and Inistioge on the Nore. The upper stretches of the Barrow and Nore, particularly the Owenass River, are very important for spawning. The site supports many other important animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat, Badger, Irish Hare and Common Frog. The rare Red Data Book fish species Smelt (*Osmerus eperlanus*) occurs in estuarine stretches of the site. In addition to the Freshwater Pearl Mussel, the site also supports two other freshwater mussel species, *Anodonta anatina* and *A. cygnea*. Three rare invertebrates have been recorded in alluvial woodland at Murphy's of the River. These are: *Neoscia obliqua* (Order Diptera: Syrphidae), *Tetanocera freyi* (Order Diptera: Sciomyzidae) and *Dictya umbrarum* (Order Diptera: Sciomyzidae). The rare invertebrate, *Mitostoma chrysomelas* (Order Arachnida), occurs in the old oak woodland at Abbeyleix and only two other sites in the country. Two flies (Order Diptera) *Chrysogaster virescens* and *Hybomitra muhlfeldi* also occur at this woodland. The site is of ornithological importance for a number of E.U. Birds Directive Annex I species, including Greenland White-fronted Goose, Whooper Swan, Bewick's Swan, Bar-tailed Godwit, Peregrine and Kingfisher. Nationally important numbers of Golden Plover and Bar-tailed Godwit are found during the winter. Wintering flocks of migratory birds are seen in Shanahoe Marsh and the Curragh and Goul Marsh, both in Co. Laois, and also along the Barrow Estuary in Waterford Harbour. There is also an extensive autumnal roosting site in the reedbeds of the Barrow Estuary used by Swallows before they leave the country. The old oak woodland at Abbeyleix has a typical bird fauna including Jay, Long-eared Owl and Raven. The reedbed at Woodstown supports populations of typical waterbirds including Mallard, Snipe, Sedge Warbler and Water Rail.

Land use at the site consists mainly of agricultural activities – mostly intensive in nature and principally grazing and silage production. Slurry is spread over much of the area. Arable crops are also grown. The spreading of slurry and fertiliser poses a threat to the water quality of the salmonid river and to the populations of E.U. Habitats Directive Annex II animal species within the site. Many of the woodlands along the rivers belong to old estates and support many non-native species. Little active woodland management occurs. Fishing is a main tourist attraction along stretches of the main rivers and their tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. There is net fishing in the estuary and a mussel bed also. Other recreational activities such as boating, golfing and walking, particularly along the Barrow towpath, are also popular. There is a golf course on the banks of the Nore at Mount Juliet and GAA pitches on the banks at Inistioge and Thomastown. There are active and disused sand and gravel pits throughout the site. Several industrial developments, which discharge into the river, border the site. New Ross is an important shipping port. Shipping to and from Waterford and Belview ports also passes through the estuary. The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, over-grazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel (*Prunus laurocerasus*) and Rhododendron (*Rhododendron ponticum*). The water quality of the site remains vulnerable. Good quality water is necessary to maintain the populations of the Annex II animal species listed above. Good quality is dependent on controlling fertilisation of the grasslands, particularly along the Nore. It also requires that sewage be properly treated before discharge. Drainage activities in the catchment can lead to flash floods which can damage the many Annex II species present. Capital and maintenance dredging within the lower reaches of the system pose a threat to migrating fish species such as lamprey and shad. Land reclamation also poses a threat to the salt meadows and the populations of legally protected species therein. Overall, the site is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive. Furthermore it is of high conservation value for the populations of bird species that use it. The occurrence of several Red Data Book plant species including three rare plants in the salt meadows and the population of the hard water form of the Freshwater Pearl Mussel, which is limited to a 10 km stretch of the Nore, add further interest to this site.

Appendix II- Aquatic Ecology

Introduction

Desktop Study

A pre-survey data search was carried out. This included a literature review to identify and collate relevant published information and ecological studies previously conducted on the aquatic ecology of the stream in the vicinity of the proposed development. It comprised of data searches from the following sources; the National Parks and Wildlife Service, NPWS Rare and Protected Species Database, National Biological Records Centre, in addition to aerial, 6 inch, satellite imagery, web searches and the previous Kilkenny County Council Local Area Plan Habitat Assessment of Ballyhale in 2010. Discussions also took place with Inland Fisheries Ireland in relation to species of conservation importance that may be present in the stream and the proposed works.

Preliminary Consultations

The stream running to the south and through Ballyhale site is the Ballyhale (or Knockwilliam¹) Stream, a tributary of the River Little Arrigle. Consultation was carried out with Inland Fisheries Ireland in October and November 2020, specifically in relation to the conservation value of the stream and the proposed works. Initial consultation with Inland Fisheries Ireland indicated that despite the stream being relatively small it is a salmonid catchment and this section of stream is likely to have a stock of salmonids. Inland Fisheries Ireland stated that it would be their preference to divert the watercourse in one single large channel with no overflows during floods. However, they were cognisant of the fact that there may be existing discharges to the stream within the village and some flows in these routes would also need to be maintained. In the event of an overflow channels being used in flood situations the potential impacts on the overflow mechanism e.g. weir and channel, full assessment on the potential impact on biodiversity including migratory fish species during flood situation and normal stream operation would need to be assessed. Migration of fish including salmonids must not be impacted negatively by the works. Donnachadh Byrne, Senior Fisheries Environmental Officer undertook a site visit in November 2020. Discussions are ongoing with Inland Fisheries Ireland.

NPWS were consulted in relation to the proposed options assessment. On the 23rd October 2020 they stated the following in relation to ecology assessments:

“Design of the flood bypass channel must ensure that the overflow channel does not form a trap for migrating fish species, does not lead to reduced flow in the Ballyhale stream causing an access barrier for fish and other aquatic species and does not lead to the spread of invasive species. Biodiversity impacts of ongoing maintenance requirement of this channel must be assessed in the EIAR.”

“The hydrological impacts of the project, including impacts of flow diversion, directly and indirectly, on the River Barrow and River Nore SAC (Site Code 2162) and its qualifying interests must be assessed. The potential for medium to long term impacts on water quality from flow diversion must also be assessed.”

“It is advised that the Appropriate Assessment may not have lacunae and must contain complete, precise and definitive findings and conclusions capable of removing all reasonable scientific doubt as to the hydrological effects of the proposed project would adversely affect the integrity of the River Barrow and River Nore SAC.”

Qualifying interest species of the River Barrow and River Nore SAC include the following aquatic species: Atlantic salmon, brook lamprey, sea lamprey, river lamprey, twaite shad and white-clawed crayfish. As outlined in the Natura Impact Statement For River Basin (15) Nore Flood Risk Management Plan (2018), the impacts to these species must be assessed and surveys should be undertaken by appropriately qualified ecologists to identify any important habitat in the vicinity of FRM works or directly downstream of the AFA, and any potentially significant impacts on these areas.”

¹ EPA Waterframework Name

“The impacts to the Annex 1 habitats ‘Water courses of plain to montane levels with the Ranunculon fluitantis and Callitricho-Batrachion vegetation’ and ‘Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)’ must also be assessed. Surveys should inform option design and design-specific mitigation.”

“Otter is a qualifying interest species of the River Barrow and River Nore SAC. Otter territories can be over 13km in length along watercourses³ and therefore otter will be found both within and outside this SAC. Appropriate Assessment must examine implications of the project for species such as otter, outside a site, provided that those implications are liable to affect the conservation objectives of the site⁴. Effects of the project on otters, including ongoing drainage maintenance, must be assessed in the AA.”

“The proposed project lies upstream of the River Nore SPA for Kingfisher. The Ecological Survey carried out as part of the Ballyhale Local Area Plan notes the presence of Kingfisher on the Ballyhale Stream. It is recommended that AA identifies potential impacts on to the conservation objectives for this species and provides appropriate mitigation, if required.”

“The Natura Impact Statement for the Nore 2018 states ‘Works should only be carried out after a method statement, detailed plans and timing of works have been agreed with the National Parks & Wildlife Service and Inland Fisheries Ireland.’”

It should be noted that the NPWS comments relate to the proposed impact of all options. It should also be noted that the above communication was submitted subsequent to the onsite surveys being carried out. It is therefore recommended that once the final route selection option has been selected, that further consultation is carried out to refine the above comments from NPWS.

Walk-over Surveys

Following the desktop study the following walk-over assessments of the site were carried out. Habitat mapping was carried out using ArcGIS 10.5 and displayed on Bing satellite imagery.

Survey	Ecologist
<i>Aquatic Flora, Fauna /Invasive species</i>	<i>Bryan Deegan (26th March 2020)</i> <i>Bryan Deegan (19th September 2020)</i>

Aquatic Flora, Fauna and Habitat

On 23rd March 2020 and on the 19th September a tributary of the River Arrigle, the Knockwilliam (Ballyhale) Stream in the vicinity of Ballyhale, was surveyed. The survey covered just upstream of Ballyhale to downstream of the proposed route options (Figure1). IFI sources reported that populations of salmonids (brown trout (*Salmo trutta*) and Atlantic salmon (*Salmo salar*)) were present in this stream. In addition freshwater crayfish (*Austropotamobius pallipes*) were reported (1991) to inhabit this stream downstream of Ballyhale (NPWS data). In addition, a short section of the River Arrigle was surveyed in the vicinity of Options A and C.

During the survey September 2020 the section of Ballyhale Stream was walked and divided into sections based on the habitat type and species present (Figure 2). No quantitative samples were taken, nor were any samples returned to the laboratory for analysis. The results from the survey are presented for each habitat type (annotated A to F) present in the 1.5km-long section of stream that was surveyed.

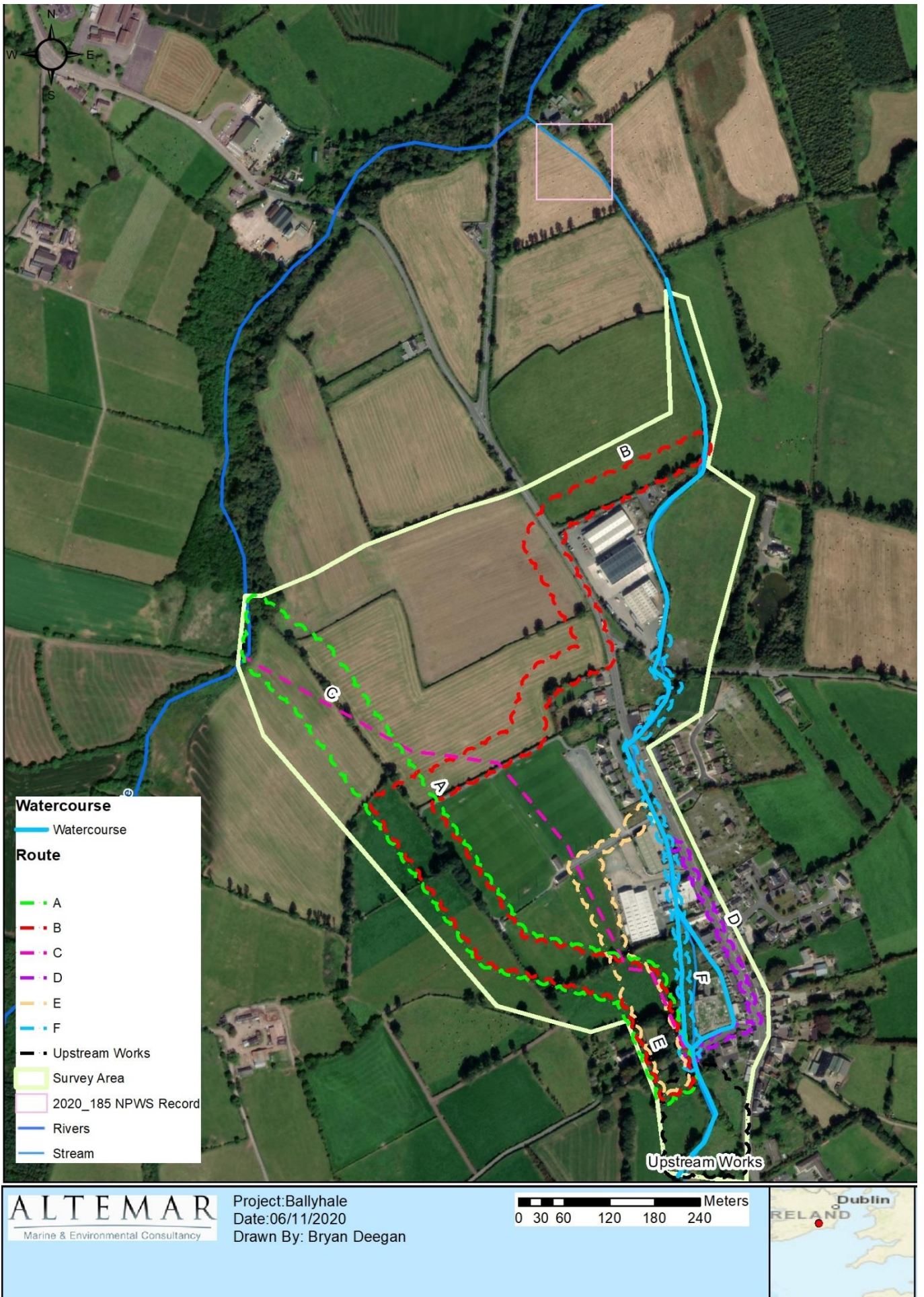
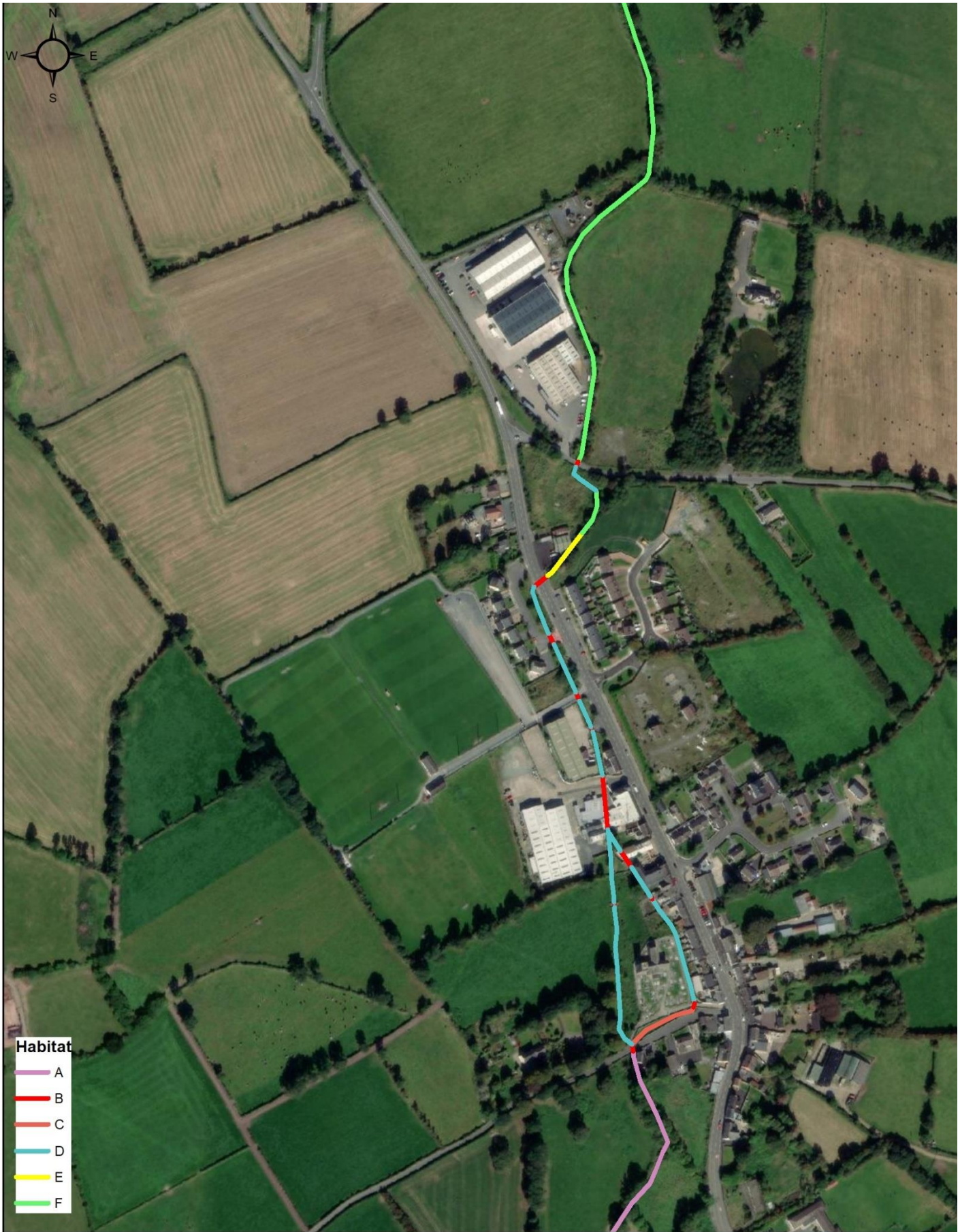


Figure 1: Stream and proposed route options for the flood relief scheme.



ALTEMAR Project: Ballyhale
 Marine & Environmental Consultancy Date: 06/11/2020
 Drawn By: Bryan Deegan

0 20 40 80 120 160 Meters

Figure 2: Stream habitat typologies.

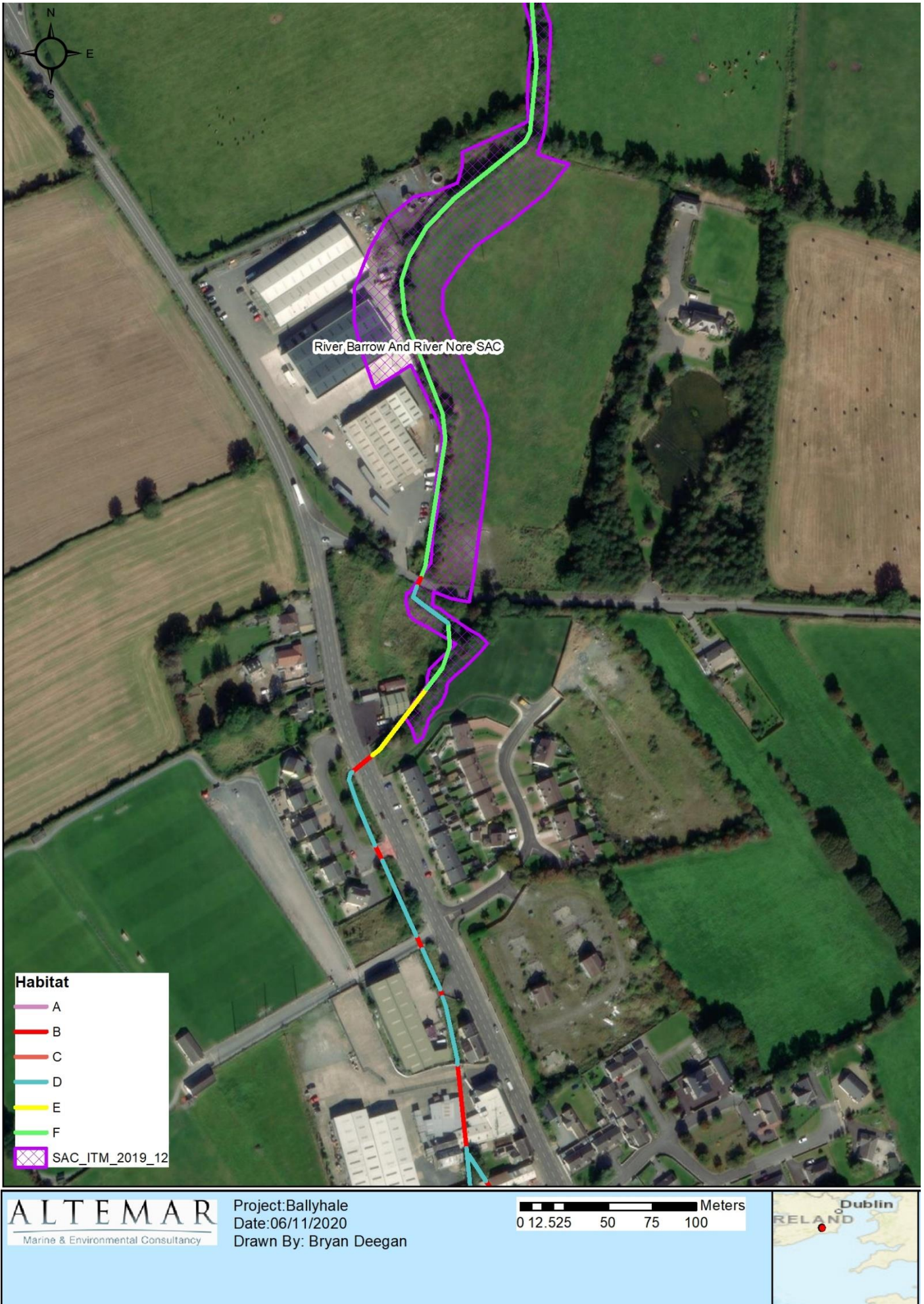


Figure 3: River Barrow and River Nore SAC.

Stream Near the Proposed Development Area

For much of its length through Ballyhale the stream is highly modified and channelled. Access to the stream from the banks within the village is often occluded by dense bankside growth fencing, culverts and bridges. In these areas the stream is between 1 and 2 metres below adjacent ground level. However, access was significantly better on the outside the village with the stream being adjacent to field level upstream of the village and slightly below field level after the village.

The stream varies in channel width from 1 to 2.5 and even 3m metres within this area. The flow is generally sluggish, although occasional short riffles are present. There are few pools, or areas of sanctuary for brown trout or juvenile salmon within the village or within the upstream section. In the upstream section of the stream the stream is silted with some locally impacted areas with “sewage fungus” on the instream rocks. Organic-rich sediment line the banksides in the upstream areas. Particularly where the stream widens and splits in the village, these silt deposits are densely vegetated in places and cause the stream to constrict between the vegetation, resulting in an increased flow at these localised and constricted locations. In the long sections of glide or flat water, which ranged in depth on the occasion of this survey from 0.2 to 0.4 metres, the bed of the stream is silted within the village with strong vegetative growth at the sited. Beneath the silt, which was up to 10cm deep in places, gravels are present, with bedrock in some areas. Of particular importance is the improvement of the habitat observed just downstream of Ballyhale where water quality and habitat appeared to improve significantly. In areas where the flow velocity is increased, gravels are seen. Very occasional large stones and small boulders are present in the stream, which are used by dipper (*Cinclus cinclus*) in this area. Within and downstream of the village the water in the stream was clear and appeared to be of good quality on the occasion of the surveys. However, there appeared to be an unidentified source of organic enrichment upstream of the village which caused the water to be cloudy.

Aquatic Flora and Fauna

Six ‘habitat types’ were identified in this section of stream (Figure 2). These were differentiated primarily by the nature of the riparian zone and stream. Overall, the instream macrophyte flora was dense in areas of low tree cover and sparse in tunnelled areas, reflecting the low light conditions that operated in most of this deeply tunnelled channel downstream of the village.

Section A



Plate 1. Section A

The channel of the stream at this location was relatively slow and sluggish and tunnelled beneath a mixture of hawthorn (*Crataegus monogyna*), ash (*Fraxinus excelsior*), blackthorn (*Prunus spinosa*) and gorse (*Ulex europaeus*). The frequent aquatic plants in this section were dense mats of watercress (*Nasturtium officinale*), water dropwort (*Oenanthe crocata*) and brooklime (*Veronica beccabunga*). An examination of the deep silt and mud deposits revealed no macroinvertebrate fauna. No fish were observed in this section. Sewage fungus was noted on the rocks.

Section B



Plate 2. Bridge located at the downstream end of Section C



Plate 3. Bridge within the town with a 30cm high weir.

Numerous sections of the stream are bridged and culverted through the town. These include several level changes within the watercourse would obstruct migrating and non migrating fish within the watercourse. These would be particularly important within spawning season and during spells of hot weather. The obstruction in in Plate 3 would obstruct the movement of salmonids and other migratory fish species within the watercourse.



Plate 4. Section C

Section C

This section of stream is located in the southern end of Ballyhale. Just prior to this section the stream evenly splits with one section of the stream going north, to the west of the town and the other section of the stream going east and then north through the worn. It is highly likely that the widening of the stream in this area to approx. 3m, the lower flow and the organic enrichment upstream has resulted in a dense mat of watercress (*Nasturtium officinale*) which would impact on fish migration within the watercourse. No fish were observed in this section.

Section D



Much of the open water sections within the village were similar in nature. Throughout the village there is very little tree cover and there is dense instream vegetation to either side of the main stream channel. Very localised and small shoals of three-spined Stickleback (*Gasterosteus aculeatus*) were observed in the vicinity of the instream vegetation, but no salmonids were observed. Plant species included watercress (*Nasturtium officinale*), dropwort (*Oenanthe crocata*) and brooklime (*Veronica beccabunga*).

Plate 5. Section D showing discharge pipe from right bank.



Plate 6. Section D to the west of Ballyhale.

Section E



Plate 7. Section E.

Downstream of Ballyhale just prior to and where the watercourse enters the SAC (Figure 3) is a very good example of salmonid habitat. Just downstream of the bridge juvenile salmonids were noted in this section and although they were not observed it, would be expected that freshwater crayfish would be present in this area, given the history of the species downstream. Otter spraints were also noted in this area. The area is slightly tunnelled but the depth of the water and gravel features would indicate that this is an important area for local biodiversity and would be sensitive to impact from works. The pool located in this area is possibly caused by scouring following the water exiting the culvert, with increased velocities. However, it does indicate that should salmonid enhancement measures and design elements be put in place on this stream a significant improvement in instream biodiversity would be seen. It is therefore recommended that NPWS and IFI are consulted throughout the design process.

Section F



Downstream of Section E the watercourse travels very tightly beside a series of industrial units with several what appear to be surface water discharges. In this area the stream is primarily heavily tunnelled which provides a biodiversity corridor for species such as otter but also results in poor in stream vegetation and cover for biodiversity. Areas of the stream in this section are slightly silted. However, much of the bed of the stream consists of exposed gravels. No instream macrofauna was observed in this section. However, based on the previous records Freshwater crayfish and salmonids would be expected in this area. Of note within this section is the Ballyhale-Knocktopher Urban Wastewater Treatment plant which carried out secondary treatment. Overall compliance in this WWTP is a “pass”.

An assessment of the potential impact of the WWTP on the River Barrow and River Nore SAC was carried out in 2010². It states that “Of the Annex I habitats listed above, only floating river vegetation occurs within 1 km downstream of the discharge and is therefore considered to be the only Annex I habitat that could potentially be affected to any significant degree.”

Little Arrigle



As can be seen from Figure 1 two route options terminate on the River Arrigle. This is within the River Barrow and River Nore SAC. This section of the river would be seen as being ecologically important from a biodiversity perspective. An area of wet woodland (WN6) is seen within this area and corresponds to a priority type (alluvial forests with *Alnus glutinosa* (alder) and ash, *Fraxinus excelsior* (91E0)) listed in the Habitats Directive. In addition, the Annex Habitat [3260] Floating River Vegetation was observed on site. The habitat quality and records indicate that the site 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 which were observed on site.

² http://www.epa.ie/licences/lic_eDMS/090151b2804a831b.pdf

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APPENDICES

Appendix 7-1	Consulted Documentary Sources
Appendix 7-2	Classification of Archaeological Monuments
Appendix 7-3	Descriptions of Monuments in Archaeological Inventory
Appendix 7-4	Descriptions of structures in Architectural Inventory

DRAWINGS

Figure 7.1 Extract from Civil Survey Map of 1654-8 for the parish of Derrinehensy (Derrynahinch)

Figure 7.2 Extract from Taylor & Skinner (1778, 131)

Figure 7.3 Extract from Ordnance Survey Map of 1839 (Kilkenny Sheets 31 & 32)

Figure 7.4 Extract from Ordnance Survey Map of 1913 (Kilkenny Sheets 31 & 32)

Figure 7.5 Aerial view of village and surrounding area within study area

Figure 7.6 Locations of Cultural Heritage Sites, Zones of Archaeological Potential/Notification and Gas Pipeline Investigations

Figure 7.7 Locations of identified Cultural Heritage sites with respect to Proposed Route Options

7 CULTURAL HERITAGE

7.1 Introduction

Cultural Heritage has been defined by UNESCO as “the legacy of physical artefacts and intangible attributes of a group or society that are inherited from past generations, maintained in the present and bestowed for the benefit of future generations” (Tangible Cultural Heritage, UNESCO <http://www.unesco.org/new/en/cairo/culture/tangible-cultural-heritage>). Cultural Heritage is assumed to include all humanly created features on the landscape, including portable artefacts, which might reflect the prehistoric, historic, architectural, engineering and/or social history of the area. Where appropriate, it also includes for non-physical aspects of heritage, such as history, linguistics, folklore, etc.

The Heritage Act (1995) contains a list of various aspects of heritage, including archaeological monuments and objects, architectural heritage, fauna, flora, geology, heritage gardens and parks, heritage objects, inland waterways, landscapes, monuments, seascapes, wildlife habitats, and wrecks.

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.

The report discusses the receiving environment from a Cultural Heritage perspective. It provides a compilation of constraints/baseline data and assesses the potential impact of the various Concept Route Option proposals on identified sites and areas of Cultural Heritage interest and/or potential.

The Cultural Heritage Assessment has been completed by Martin Byrne, Byrne Mullins & Associates, Archaeological & Historical Heritage Consultants, who holds a BA degree in Archaeology & History, a MA degree in Archaeology and a Diploma in EIA Management. He is a former Chairperson of the Institute of Archaeologists of Ireland, was the Institute representative to the Royal Irish Academy Standing Committee for Archaeology and serves as a company member, on behalf of the Institute, to the Discovery Programme – Centre for Irish Archaeological Research. He served on the National Monuments Service Expert Advisory Committee (2009-2010) which reviewed the proposed National Monuments (Consolidated) Act with respect to the area of Monument Protection. He has over thirty years' experience in the provision of Cultural Heritage Consultancy Services across a wide range of developments, including Flood Relief Projects

7.2 Assessment Methodology

The Cultural Heritage components of the study comprise the results of a survey and evaluation of sites of archaeological, architectural and historical potential within, and in the immediate environs of, the proposed development area. The work consists of the results of a paper survey and preliminary field/windshield inspection

7.2.1 Study Area

A 300m-wide corridor with the various Concept Route Options acting as a centre-line was determined to be the Study Area for Cultural Heritage. The extent of the Cultural Heritage Study Area was chosen to reflect an appropriate context for the development, beyond which it was considered that a development of this nature would have no direct/indirect impacts.

7.2.2 Paper Survey

The Paper Survey comprised documentary, cartographic and aerial photographic research using the following principal sources:

- Record of Monuments and Places – Co. Kilkenny (RMP)
- Archive files of the Archaeological Survey of Ireland (ASI) – www.archaeology.ie
- Topographical Files of the National Museum of Ireland (NMI)
- Excavations – Summary Accounts of Archaeological Excavations in Ireland – www.excavations.ie
- Aerial Photographic and Historic Map Archive of Ordnance Survey of Ireland – www.osi.ie
- Kilkenny County Development Plan 2014 – 2020 (KCDP) including Record of Protected Structures (RPS)
- National Inventory of Architectural Heritage – Survey of the Architectural Heritage of County Kilkenny (NIAH) – www.buildingsofireland.ie
- Placenames Commission – www.logainm.ie
- Heritage Council Heritage Maps & Data – www.heritagemaps.ie
- National Folklore Collection (The School's Collection) – www.duchas.ie
- Documentary and Cartographic sources (see Appendix 7.1).

7.2.3 Preliminary Field Inspection

No focussed field inspection/surface reconnaissance survey was undertaken with respect to the preparation of the constraints report, although the area was visited in order to determine the general heritage landscape character of the study area.

7.2.4 Difficulties Encountered

No difficulties were encountered with respect to undertaking of the Paper Survey or subsequent preliminary Field Inspection.

7.3 Baseline Environment

7.3.1 Historical Background

The proposed project area encompasses portions of the townlands of Ballyhale and Kiltorcan, in the civil parish of Derrynahinch and barony of Knocktopher (O.S. 6" Map: Kilkenny Sheets 31 & 32). Ballyhale derives from the Irish *Baile Héil* – ‘Hale’s or Howel’s townland/town/homestead’, while Kiltorcan derives from *Cill Torcáin* – the ‘church of Torcain’ (Placenames Commission www.logainm.ie). Carrigan (1905, 14) notes that Hale or Howel was known to be a Christian name associated with the Walsh family.

County Kilkenny takes its name from the city of Kilkenny. Kilkenny is the anglicised version of the Irish *Cill Chainnigh*, meaning Church (Cell) of Cainneach or Canice. This probably relates to the church and round tower, now St. Canice's Cathedral (Kilkenny City), which was built in honour of St. Canice. The Kingdom of Osraige was one of the ancient Kingdoms of Ireland. The Kings of Osraige, the Mac Giolla Phádraig family, reigned over Osraige and Cill Chainnigh was their stronghold. The Kingdom of Ossory existed from at least the 2nd century until the 13th century AD. The current ecclesiastical diocese of that area is still known as Ossory. The medieval Diocese of Ossory was established in 549 AD, and its territory corresponded to the medieval Kingdom of Ossory. In historic times, Kilkenny replaced Aghaboe as the chief church in Osraige. Osraige formed the easternmost part of the kingdom and province of Munster until the middle of the 9th century, after which it was attached to Leinster and largely acted as a buffer state between Leinster and Munster.

Following the Anglo-Norman invasions in 1169, Kilkenny formed part of the lordship of Leinster under the control of Richard de Clare (Strongbow), who, in c.1173, established a castle and town at Kilkenny (city). In the late 14th century Kilkenny passed into the hands of the powerful Butler earls of Ormond, who provided an enduring source of patronage.

Carrigan (1905, 14-15) states that the present townland of Ballyhale originally formed part of Kiltorcan and was formed following the Anglo-Norman invasions...“It’s separation from Kiltorcan is marked by an anomalous, but, in similar cases of dismemberment of townlands, a very unusual circumstance, viz., the new townland of Ballyhale was made to take in the church of Kiltorcan, which, therefore in the course of time, came to be known exclusively as the church of Ballyhale; while the new townland of Kiltorcan, though still retaining the old ecclesiastical name, was left without a church or church site”. The church of Kiltorcan (Ballyhale) was appropriated to Kells Priory, probably sometime in the 13th century. Carrigan (*ibid.*) notes that it is “mentioned in four of the lists of the churches in the *Red Book of Ossory*, and always as a “Capella”. Two of these lists style it “Capella de Kiltorcan”; the other two, “Capella de Kyltorkan” and “Capella de Kiltorcan”. It appears, on the other hand, as the “Capella de Howellstoun” in a confirmation by Henry IV, Feb. 6th, 1412, of all churches and glebes granted by Kells Priory up to said date. In some documents of 1540 and 1541, relating to the same Priory soon after its suppression, “Hoeliston” or “Howeleston” is mentioned as a “Rector”; but it is plain from the *Red Book of Ossory* that, if it ever were a Rector, as most probably it was in early times, it must have ceased as such, even before the year 1300”. Ever since the Reformation, Ballyhale and Kiltorcan have formed part of the civil parish of Derrynahinch”.

In 1641, a major rebellion broke out in Ireland, and County Kilkenny produced strong support for Confederate Ireland, with the seat of the Supreme Council and General Assembly of the Catholic Confederation (‘Confederation of Kilkenny’) located in Kilkenny City. Oliver Cromwell and his English Parliamentarian Army arrived in the county in 1650 and captured Kilkenny City in March and soon afterwards the county was in English control. Having emerged victorious in Ireland, the English Commonwealth, immediately undertook an ambitious project of social engineering, underpinned by a massive transfer in landownership from Irish Catholics to English Protestants. For this to happen, the land had to be accurately surveyed and mapped, a task overseen by the surgeon-general of the English army, William Petty. The Civil Survey was undertaken from 1654-58 and is popularly known as the ‘Down Survey’. Details from the Civil Survey relating to the townlands through which the proposed development is routed are included in Table 7.1 below and are based on information from the *Down Survey Project* (www.downsurvey.tcd.ie). The Down/Civil Survey map for the parish of Derrynahinch (then known as Derrinehensy) is illustrated in Figure 7.1.



Figure 7.1 Extract from Civil Survey Map of 1654-8 for the parish of Derrinehensy (Derrynahinch)

Townland	Civil Survey Name	1641 Owner	1670 Owner	Other Information
Ballyhale	Ballyhoyle	Edmund Howling (Protestant) Peter Anthony (Protestant)	Thomas Walsh (Protestant) Philip Ffernesly (Protestant)	Profitable Land: 674 plantation acres Forfeited Land: 674 plantation acres 1659 Census: 38 English 13 Irish Titulado: Henry Wade Capt. Tomlins John Johnson
Killtorcan	Killtorcan	Edmund Butler (Catholic)	Earl of Ormond (Protestant)	Profitable Land: 265 plantation acres Forfeited Land: 265 plantation acres 1659 Census: 15 English

Table 7.1 Information from Civil/Down Survey for townlands within Study Area

In the early part of the 18th century, according to Carrigan (1905, 16), the mass-house of Ballyhale (Catholic) parish was in the townland of Derrynahinch and continued in use until

around 1750 when the former church site at Ballyhale was secured and a chapel constructed.

Generalised indications of the main features of the area in the 1770s are illustrated by Taylor & Skinner (Figure 7.2) with the major landholder in the area identified as Kavanagh.



Figure 7.2 Extract from Taylor & Skinner (1778, 131) [North to bottom]

The Catholic church was partially destroyed following a fire but was repaired sometime from 1796 to 1801, with further rebuilding/repairs undertaken in 1804 and in 1802 Tighe recorded Ballyhale as a small village with 'little more than twelve houses' and permission of a fair.

In 1832, there was a gathering of c.200,000 people at Ballyhale for the trial of those charged in aftermath of The Battle of Carrickshock, otherwise known as the Carrickshock incident; this was a confrontation between the Irish Constabulary and local Catholic tenant farmers near Carrickshock, Hugginstown, on 14 December 1831, during the Tithe War in Ireland. Seventeen were killed: 14 of a party attempting to collect tithes and three of the crowd of locals who confronted them. The trial had a significant influence on its overall outcome for anti-tithe movement, resulting in the beginning of the end of tithes in Ireland. Those charged were successfully defended by Daniel O'Connell, and who addressed the gathering in Irish. It was the first 'monster meeting' of that time.

Lewis (1836, 136) described the village of Ballyhale at that time as containing 69 houses and 369 inhabitants, with fairs held in January, March, May, July September November and December.

The topographical nature of the area in 1839 is illustrated below in Figure 7.3. The Little Arrigle River, to the west, is indicated as serving as a townland and civil parish boundary, while the boundary between Ballyhale and Kiltorkan is indicated by a red line to the northwest. The Ballyhale River is indicated as a solid black line running north to the west of the village before turning northeast at Ballyhale Bridge. Only a single channel is indicated and this is to the east of the church & graveyard. The layout of the village is illustrated with

the R.C. church, graveyard and 'Ballyhale Castle' (in ruins), together with Ballyhale Bridge to the north, as the only named features.

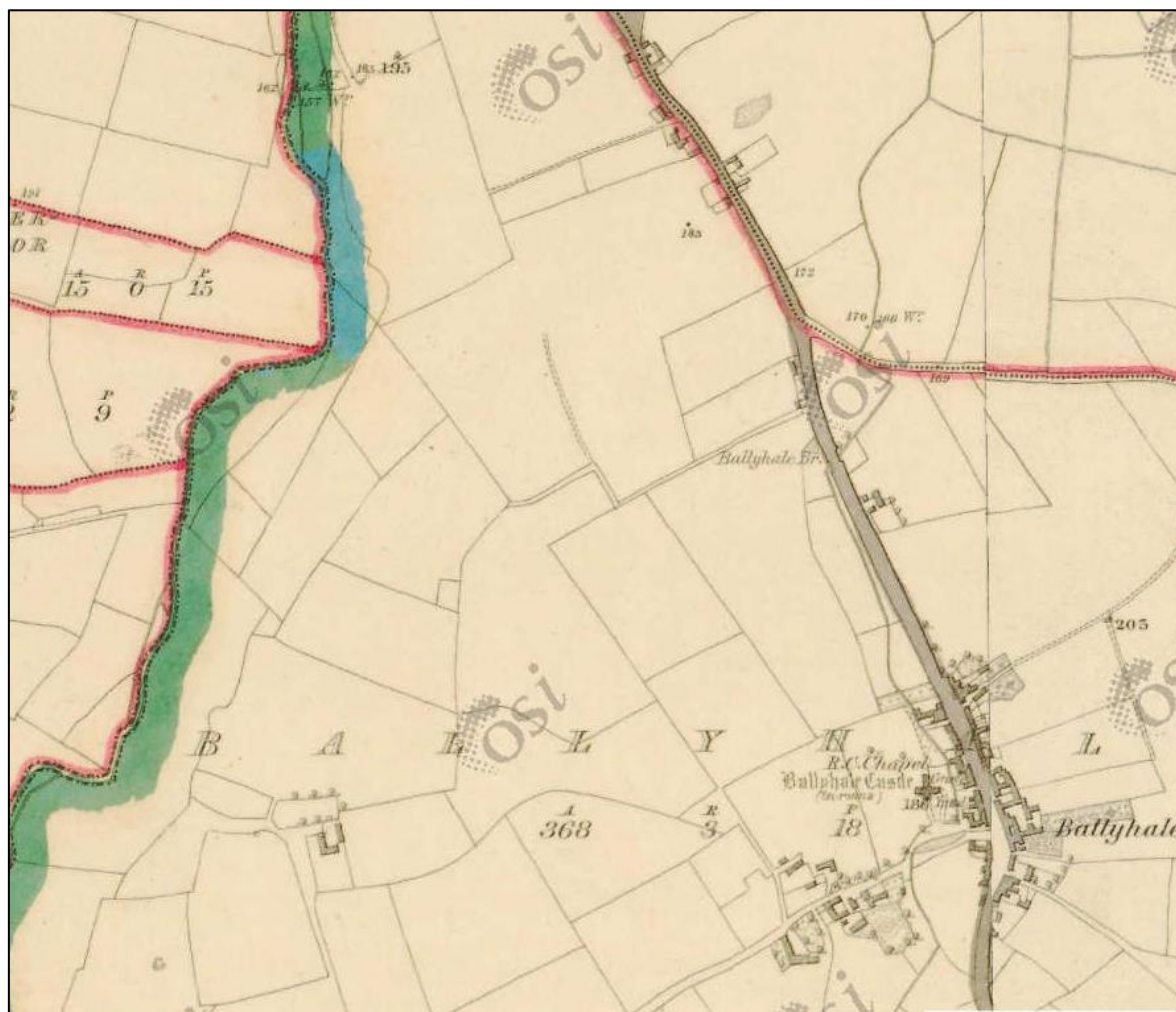


Figure 7.3 Extract from Ordnance Survey Map of 1839 (Kilkenny Sheets 31 & 32)

Griffith's Valuation of 1853 notes that much of the townland of Ballyhale formed part of a landholding owned by Rev. Henry Moore, with the area of Kiltorcan within the study area owned by John Holden or John Hutchinson. All these lands were occupied and/or farmed by various tenants.

A railway station was constructed to the east of the village as part of the development of the Portlaoise to Waterford Railway Line. This was constructed on a phased basis by different railway companies, with the section from Jerpoint Hill to Dunkitt, including Ballyhale, opened in 1853 by the Waterford & Kilkenny Railway Company (Johnson, 1997, 71). In 1855, the Catholic church was further rebuilt, 'almost from its foundations', and dedicated to St. Martin of Tours.

Ballyhale Creamery was founded in 1895, the year after the founding of The Irish Agricultural Organisation Society that began the cooperative movement in earnest in Ireland.

The topographical nature of the area in 1913 is illustrated below in Figure 7.4, with contours, bench marks and levels indicated. Very little changes to the field division layouts in the agricultural lands had occurred since those indicated on the 1839 map (Figure 7.3). The Ballyhale River is indicated with more clarity as a twin-lined feature to the east of the R.C. chapel and graveyard, and a ford is marked on the Little Arrigle River; the areas immediately along both banks of the latter are shown as marshy. The village has expanded slightly in the area to the south of the church, between the Ballyhale River and the Main Street, with some structures a little further to the west of this area, on the southern side of the road, appear to have been removed almost in their entirety. A smithy is marked towards the northern end of the village, with Ballyhale Bridge, St. Martin's R.C. Chapel and 'Ballyhale Castle' being the only other named structures.

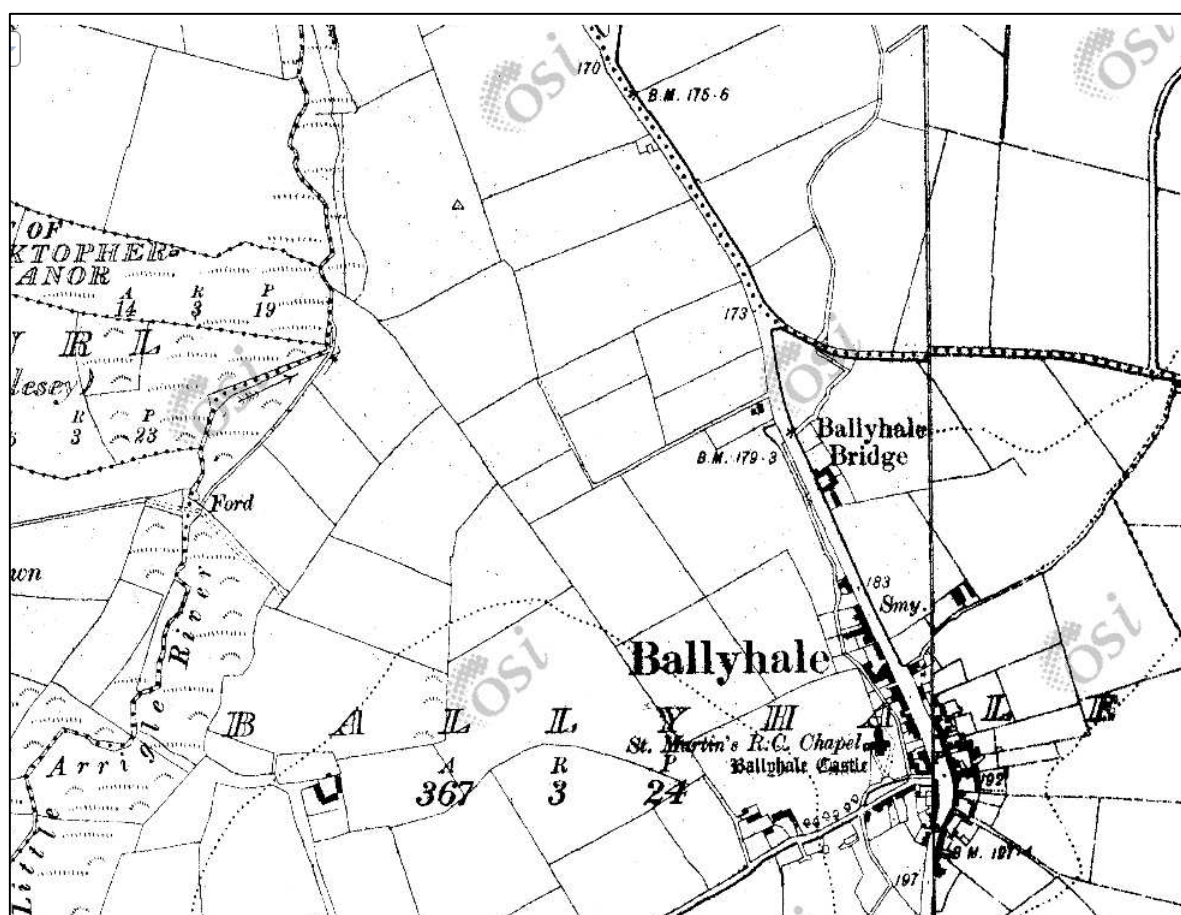


Figure 7.4 Extract from Ordnance Survey Map of 1913 (Kilkenny Sheets 31 & 32)

Ballyhale is now small village (Figure 7.5), primarily focused on one street, resulting in a linear pattern that extends approximately 500m in length. This linear pattern takes the form of a meandering, sinuous road alignment, which adds interest to the streetscape. There are some smaller roads leading off the Main Street, but there is little development on them, and overall a linear pattern predominates. The plots front onto the street, with agricultural lands

to their rear. Plots on the west side of the street tend to be short and consistently narrower than those on the east side, where the plots run deeper and give way to a much greater mix of outbuildings. Most of the buildings date from the late 18th and 19th centuries. Of particular interest to the subject project is a second channel to the Ballyhale River positioned to the west of the R.C. church and graveyard, excavated sometime after 1913.

Ballyhale Shamrocks GAA is the local Gaelic Athletic Association club, having amalgamated with Knocktopher GAA Hurling Club and Knockmoylan GAA Clubs in 1972. They are the most successful hurling club in the country and have produced a number of very successful county hurling players. The club also play Gaelic football and have won the county championship on three occasions. The club grounds are located on the northern/north-western outskirts of the village.



Figure 7.5 Aerial view of village and surrounding area within study area

7.3.2 Archaeological Heritage

Archaeology is the study of past societies through their material remains and the landscapes they lived in. 'Archaeological Heritage consists of such material remains (whether in the form of sites and monuments or artefacts in the sense of moveable objects) and environmental evidence' (DAHGI, 1999, 9).

7.3.2.1 Statutory Protections

The statutory and administrative framework of development control in zones of archaeological potential or in proximity to recorded monuments has two main elements:

- (a) Archaeological preservation and licensing under the National Monuments Acts; and
- (b) Development plans and planning applications under the Planning Acts.

(a) National Monuments Acts 1930-2004

Section 12 (1) of the National Monuments (Amendment) Act, 1994 provides that the Minister for the Environment, Heritage and Local Government shall establish and maintain a record of monuments and places where the Minister believes there are monuments, such record to be comprised of a list of monuments and relevant places and a map or maps showing each monument and relevant place in respect to each county of the State. This is referred to as the 'Record of Monuments and Places' (RMP), and monuments entered into it are referred to as 'Recorded Monuments'.

Section 12(3) of the National Monuments (Amendment) Act 1994 provides for the protection of monuments and places in the record, stating that

"When the owner or occupier (not being the Minister) of a monument or place which has been recorded under subsection (1) of this section or any person proposes to carry out, or to cause or permit the carrying out of, any work at or in relation to such monument or place, he shall give notice in writing of his proposal to carry out the work to the Minister and shall not, except in the case of urgent necessity and with the consent of the Minister, commence work for a period of two months after having given the notice.

(b) Kilkenny County Development Plan 2014-2020

The following project relevant policies and objectives in relation to Archaeological Heritage are contained in Section 8.3.1 of the Plan:

Development Management Standards (DMS):

- Endeavour to preserve in situ all archaeological monuments, whether on land or underwater, listed in the Record of Monuments and Places (RMP), and any newly discovered archaeological sites, features, or objects by requiring that archaeological remains are identified and fully considered at the very earliest stages of the development process and that schemes are designed to avoid impacting on the archaeological heritage.
- To require archaeological assessment, surveys, test excavation and/or monitoring for planning applications in areas of archaeological importance if a development proposal is likely to impact upon in-situ archaeological monuments, their setting and archaeological remains.
- Ensure that development within the vicinity of a Recorded Monument is sited and designed appropriately so that it does not seriously detract from the setting of the feature or its zone of archaeological potential. Where upstanding remains of a Recorded Monument exist a visual impact assessment may be required to fully determine the effect of any proposed development.
- Require the retention of surviving medieval plots and street patterns and to facilitate the recording of evidence of ancient boundaries, layouts etc. in the course of development.
- Safeguard the importance of significant archaeological or historic landscapes from developments that would unduly sever or disrupt the relationship, connectivity and/or inter-visibility between sites.

Underwater Archaeology:

- Any development near watercourses, be they freshwater or in marine/coastal areas, should take into account the potential to encounter underwater cultural heritage. Such sites may include sources of underwater cultural heritage such as shipwrecks, fish traps, fording points, bridges, intertidal kelp grids, etc. as well as artefactual material from an underwater context. Due regard to the Shipwreck Inventory of Ireland database and Ports and Harbours Archive, as held by the Underwater Archaeology Unit in the National Monuments Service, should be consulted as part of this aspect of archaeological heritage. Any development either above or below water, including to river banks or coastal edges, within the vicinity of a site of archaeological interest shall not be detrimental to the character of the archaeological site or its setting. Planning applications will be referred to the Department of Arts, Heritage and the Gaeltacht in this regard where relevant.

In addition, the following Objective, with respect to Archaeological Heritage, is contained in the Plan:

8I Protect archaeological sites and monuments (including their setting), underwater archaeology, and archaeological objects, including those that are listed in the Record of Monuments and Places, and in the Urban Archaeological Survey of County Kilkenny or newly discovered sub-surface and underwater archaeological remains.

Note: The Record of Monuments and Places (RMP) for County Kilkenny was published in 1996. Consequently, all monuments discovered since the publication are not RMP Sites but are subject to protection under the DMS of the Kilkenny County Development Plan 2014-2020, as set out above.

7.3.2.2 Archaeological Inventory

(a) Terrestrial Archaeology

There are three sites of archaeological interest/potential located within the defined Cultural Heritage Study Area (Section 7.2.1 above); one of these (CH-1) includes four individual elements. Three of the individual elements of CH-1, together with CH-2, are included in the RMP with the remainder identified following publication of the RMP in 1996. These sites are listed below in Table 7.2 and their locations are indicated in Figure 7.6. The classifications of the monuments/sites are described in Appendix 2 and they are individually described in Appendix 3.

The following abbreviations/codes are used in relation to Table 7.2:

Site No.: Individual site number assigned to site with respect to the defined study area.

SMR No: Individual number assigned to site in the Sites and Monuments Record of the Archaeological Survey of Ireland

Classification: Brief nature of the archaeological site as listed in the RMP (see Appendix 2)

RMP: Listed in the Record of Monuments and Places

KCDP: Listed in the Kilkenny Council Development Plan

Distance: Distance from closest edge of Zone of Archaeological Potential/Notification associated with the monument to proposed project area; where any section of the proposed project area is located within a Zone of Archaeological Potential/Notification, then the distance is considered 0m.

Site No.	SMR No(s).	ITM	Townland	Classification	Protection	Distance	
CH-1 a	KK031-034001	654267 635393	Ballyhale	Church	RMP; KCDP	0m	
	b	KK031-034002		654258 635361	Graveyard		RMP; KCDP
	c	KK031-034004		634251 635385	Font		RMP; KCDP
	d	KK031-034005		654252 635390	Castle – unclassified		KCDP
CH-2	KK031-070	654205 635256	Ballyhale	Souterrain	RMP; KCDP	0m	
CH-3	KK031-090	654202 635109	Ballyhale	Burnt Mound	KCDP	c.20m	

Table 7.2 Archaeological Inventory (Terrestrial)

(b) Underwater Archaeology

Watercourses have always attracted human activity for a variety of reasons, as a source of water and food, as transport routes, as a source of energy and for their spiritual, religious or ritual associations. They also act as depositories for archaeological artefacts.

There are a number of watercourses within the overall study area, including the Ballyhale and Little Arrigle rivers, together with minor stream or drain tributaries. The Little Arrigle River acts as a townland and civil parish boundary, as illustrated above in Figure 7.3.

7.3.2.3 Reported Archaeological Artefacts

A search of the Topographical Files of the National Museum of Ireland determined that no 'stray' objects have been reported from the area.

7.3.2.4 Results from Previous Documented Archaeological Investigations

A search undertaken of the annual Archaeological Excavations Bulletin (www.excavations.ie) indicates that a number of licensed archaeological investigations are recorded for the immediate area. These are listed in chronological order, as follows:

- **Ballyhale – Licence No: 06E0857 (excavations.ie Ref: 2006:991)**

A programme of pre-development Archaeological Testing was undertaken by Mary Henry, Mary Henry Archaeological Services of a proposed residential development to the south of KK031-070 (CH-2 above). Sixteen trenches were opened and nothing of archaeological interest was uncovered.

- **Ballyhale – Licence No: 06E0958 (excavations.ie Ref: 2006:992)**

A programme of Archaeological Monitoring of ground reduction/site preparation works was undertaken by Patrick Neary with respect to a residential development close to KK031-034 (CH-1 above). Nothing of archaeological interest was uncovered.

- **Ballyhale – Licence No: 07E0524 (excavations.ie Ref: 2007:874)**

A programme of pre-development Archaeological Testing was undertaken by Mary Henry, Mary Henry Archaeological Services of a proposed residential development, which included KK031-070 (CH-2 above) in the northern area of the site and following a Geophysical Survey. Fourteen test-trenches were opened, with the majority in the northern portion of the site. These trenches yielded fifteen features, with two located in more than one trench.

A burnt mound (c. 16.2m x 13.4m) was uncovered comprising frequent to abundant small to medium fragments of rounded sandstone and large quantities of angular burnt stone and some charcoal flecks. Plough furrows had spread the material N and S (the dimensions cited include this spreading).

Some possible stone-lined drains were encountered in the area of the souterrain (KK031-070) and it was suggested that these might be associated with a system for a buildings marked on the 1839 O.S. map (Figure 7.2 above), with the potential that one of these might have been associated with milling. In addition, it was suggested that the 'souterrain', which was discovered in the 19th century, might not be of archaeological interest but associated with stone-lined drains.

In the western part of the site, testing revealed a number of features, including an L-shaped feature which appeared to extend under a field boundary, and a possible subcircular feature (pit?).

- **Ballyhale – Licence No: 07E1142 (excavations.ie Ref: 2007:875)**

Additional test trenching was undertaken by John Purcell at the previous site (Ref: 2007:874) to gather further information relating to the features uncovered in the western area (possible enclosure?). The trenches uncovered no evidence of an enclosure or ringfort. A number of individual features were uncovered; however, these did not form part of a bank and ditch feature and were not linked. Two large features (F5 and F7) were uncovered during the testing. These were similar in shape and size to a ditch; however, the two features were not linked and did not extend into the adjacent trenches. A number of other small features were uncovered; these are small in nature and do not necessarily form part of a larger settlement.

- **Various Townlands – Licence no: 12E0356 (excavations.ie Ref: 2012:0334)**

Archaeological monitoring of topsoil stripping associated with the construction of the gas pipeline from Baunlusk, Co. Kilkenny to Great Island Generation Station, Co. Wexford was undertaken in 2012 and 2013 by Bruce Sutton, TVAS (Ireland) Ltd; the construction

corridor was 100m wide, with a 40m wide corridor subjected to topsoil stripping. A number of previously unrecorded archaeological sites/features were uncovered in the townland of Ballyhale and subsequently investigated by David Murphy (see next entry).

- **Ballyhale – Licence No: 13E0417 (excavations.ie Ref: 2013:081)**

Sites 15-5, 6, 7, 8 Ballyhale was discovered during monitoring of topsoil stripping for the Bord Gáis Networks Gas to Great Island scheme (12E0356).

Four distinct areas were subsequently excavated by David Murphy, TVAS (Ireland) Ltd, three of which revealed unrelated prehistoric activity.

Area 15-5 contained sixteen pits, post- and stake-holes. Amongst these was a circular pit containing burnt animal bone that was surrounded by a number of stake-holes. A sub-rectangular pit or trough that measured 1.5m by 1.1m and was 0.2m deep was filled with heat-shattered stone and charcoal-rich soil. Five stake-holes cut into the corners of the pit presumably represent an organic lining. Pomaceous fruitwood charcoal from this pit was dated to 1278-1054 cal. BC (2965±35 BP; UBA-24965; 2 sigma), placing the pit in the Middle-Late Bronze Age. The topsoil contained a rubbing/hammer stone that most likely dates to the Late Neolithic or Bronze Age.

Area 15-6 proved to be non-archaeological.

Area 15-7 contained several pits, post-holes, linear features and stake-holes that did not form a clear pattern but probably represented settlement. One of the pits yielded alder charcoal that was radiocarbon dated to 1639-1435 cal. BC (3264±47 BP; UBA-24967; 2 sigma), placing the activity in the Middle Bronze Age.

Area 15-8 comprised the remains of an Iron Age smelting furnace. The single feature was an oval pit, 0.43m long, 0.3m wide and 0.11m deep with near-vertical sides and a flat base. Oxidisation of the surrounding subsoil indicated high temperatures and just over 2kg of iron smelting slag was recovered from the fill of the feature. A charred hazelnut shell from the furnace was radiocarbon dated to 362-174 cal. BC (2189±32 BP; UBA-24966; 2 sigma), placing the metalworking activity in Developed Iron Age.

The features were centred on an area to the east of the Little Arrigle River, as illustrated below in Figure 7.6.

7.3.2.5 Archaeological Potential of Proposed Project Area

The siting preferences of particular monument types are well documented. Broadly speaking, the general landscape of the study area offers a potential setting for additional sites and remains as follows:

- The subject route and surrounding landscape offer many opportunities for the location of Fulachta Fiadh (prehistoric cooking sites). These sites are location specific, generally located close to streams and rivers or in wet marshy areas, and sometimes occur in groups.
- The general rolling nature of the landscape is a favoured position for the location of prehistoric burial sites, ringforts and enclosure sites in the general region surrounding the subject development lands
- Waterways have always attracted human activity for a variety of reasons, as a source of water and food, as transport routes as a source of energy and for their spiritual, religious or ritual associations. They also act as depositories for archaeological artefacts.
- The area under assessment is part of a landscape which is rich in historical and archaeological material. The general region has attracted settlement from early times as evidenced by the presence of monuments dating back to the prehistoric period. Continuity of settlement is illustrated by artefacts dating to the Bronze Age and by identified monuments ranging from Neolithic to Medieval and Post-Medieval remains.

The archaeological potential of the general area is highlighted by the discovery of previously unrecorded archaeological sites within the construction corridor of the Gas Pipeline from Baunlusk, Co. Kilkenny to Great Island Generation Station, Co. Wexford N25 (New Ross Bypass), including prehistoric features uncovered and excavated within Ballyhale townland.

7.3.3 Architectural Heritage

7.3.3.1 Introduction

Architectural heritage has several definitions and meanings for people. A useful rule of thumb (which is actually the legal situation) is set out in the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act, 1999 which provides the following definition:

- a) Structures and buildings together with their settings and attendant grounds, fixtures and fittings,
- b) Groups of such structures and buildings, and
- c) Sites, which are of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest.

A rich architectural heritage has survived to the present day in County Kilkenny. While there are impressive demesne features and large houses in the county, many of the county's architectural heritage has come from vernacular traditions with local craftsmen sometimes borrowing from the traditions of classical architecture to construct buildings that met local needs. This rich architectural heritage contributes enormously to the overall built environment and, indeed, helps to give it definition in terms of place and character for those that live and work in the county as well as those who visit here.

7.3.3.2 Statutory Protections

The statutory and administrative framework of development control with respect to structures of architectural heritage interest is contained in Development Plans and planning applications under the Planning Acts.

Protecting architectural heritage is a function of the planning authority, through its Development Plan. Section 51 of the Planning and Development Act, 2000 (as amended) requires that a Development Plan must include policy objectives to protect structures or parts of structures of special interest within its functional area. The Development Plan to include a record of structures. These structures form part of the architectural heritage of the County and are to be protected. The primary means of achieving this is to include a Record of Protected Structures (RPS) for the functional area within the development plan. A planning authority is obliged to include in the RPS every structure, which, in its opinion, is of architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest.

A protected structure, unless otherwise stated in the RPS, includes the interior of the structure, land lying within the curtilage, any other structures lying within that curtilage and their interiors, plus all fixtures and features which form a part of the interior or exterior of any of these structures.

7.3.3.3 Kilkenny County Development Plan 2014-2020

Kilkenny County Council has drawn up a list, referred to as the Record of Protected Structures (RPS), in which each structure is given a reference number and is a constituent part of the County Development Plan.

The following relevant Objective, with respect to Architectural Heritage, is contained in Section 8.3.5 of the Plan:

8K To ensure the protection of the architectural heritage of County Kilkenny by including all structures considered to be of special architectural, historical, archaeological, artistic, cultural, scientific, social or technical interest in the Record of Protected Structures.

There are eight structures/structural groups listed in the Record of Protected Structures (RPS) of the Kilkenny County Development Plan 2014-2020 as being located within the village of Ballyhale – Sites CH-1 (a & d), CH-4 (a, b, c & d), CH-5, CH-6, CH-7, CH-8 & CH-9; one of the structures forms part of CH-4 (b) and is also listed in the RPS as CH-5, while CH-1a & b are also listed in the Archaeological Inventory (Table 7.2 above). The sites are listed below in Table 7.3. The locations of the structures are illustrated in Figure 7.6 and they are briefly described in Appendix 4.

7.3.3.4 National Inventory of Architectural Heritage (NIAH)

The National Inventory of Architectural Heritage (NIAH) is a state initiative under the administration of the Department of Culture, Heritage and the Gaeltacht. It was established on a statutory basis under the provisions of the Architectural Heritage (National Inventory) and Historic Monuments (Miscellaneous Provisions) Act 1999. Its purpose is to identify, record, and evaluate the post-1700 architectural heritage of Ireland, uniformly and consistently as an aid in the protection and conservation of the built heritage. It is intended that the NIAH will provide the basis for the recommendations of the Minister for Culture, Heritage and the Gaeltacht to the planning authorities. The NIAH includes structures and garden features.

7.3.3.5 Architectural Inventory

There are nine structures of Architectural Heritage interest listed by the non-statutory NIAH as being located within the subject study area, only one of which, CH-10, is not included in the RPS. The locations of these structures are illustrated below in Figure 7.6 and listed in Table 7.3. They are briefly described in Appendix 4.

The following abbreviations/codes are used in relation to Table 7.3:

Site No.: Individual site number assigned to site with respect to the defined study area.

RPS No: Individual number assigned to structure in Record of Protected Structures

NIAH No: Individual number assigned to the structure by the NIAH

Classification: Brief nature of the archaeological site as listed in the RPS

Rating: Level of Significance/Interest listed by NIAH

Where a structure is located within, or adjacent, a possible Route Option/Conveyance Area, then the site is highlighted in grey.

Site No.	RPS No.	NIAH No.	ITM	Classification	Rating
CH-1a CH-1d	C2 C1	12322003	654254 635390 654267 635393	Catholic Church Tower House	Regional
CH-4 CH-4a CH-4b/CH-5 CH-4c CH-4d	C3 C3 C3/C5 C3 C3	12322005 12322001	654330 635411 654333 635403 654339 635388 654351 635349	Row of two-storey houses House Public House (Walsh's Bar) House House	Regional Regional
CH-6	C544	12322006	654303 635476	House	Regional
CH-7	C865	12322007	654356 635548	Parochial House	Regional
CH-8	C864	12322002	654242 635319	Bridge	Regional
CH-9	C866	12322008	654165 635731	Bridge	Regional
CH-10	C867	12322009	654161 235314	Farm House	Regional
CH-11		12322004	654326 635400	Water Pump	Regional

Table 7.4 Architectural Inventory

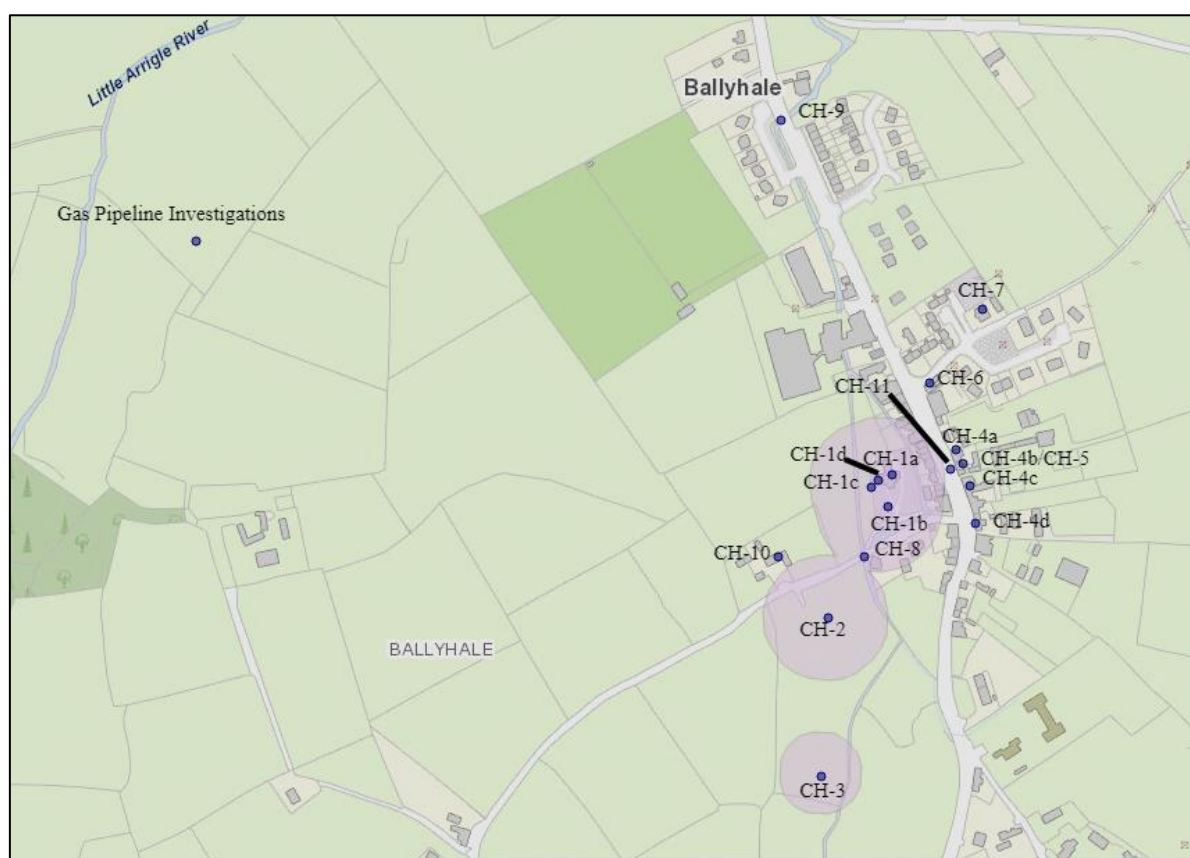


Figure 7.6 Locations of Cultural Heritage Sites, Zones of Archaeological Potential/Notification and Gas Pipeline Investigations

7.4 Impacts of Development

7.4.1 Impact Criteria

The criteria for determining the significance of effects involves defining the magnitude of the impacts and the sensitivity of the receptors.

The criteria for defining magnitude with respect to Cultural Heritage resources, based on standard authorities and guidelines, are outlined in Table 7.5 below. These criteria are treated as an aid to professional judgement and cannot offer exact descriptions of what will occur in all cases.

Magnitude of Impact	Definition
High	<p>Negative: Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse). Applies where mitigation would be unlikely to remove adverse effects. Reserved for adverse, negative effects only. These effects arise where a cultural heritage asset is completely and irreversibly destroyed by the Project.</p> <p>Positive: Large scale or major improvement or resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial) e.g. providing access to a monument</p>
Medium	<p>Negative: Loss of resource, but not adversely affecting integrity of resource; partial loss of/damage to key characteristics, features or elements (Adverse). An impact which, by its magnitude, duration or intensity alters an important aspect of the environment. An impact like this would be where part of a cultural heritage asset would be permanently impacted upon leading to a loss of character, integrity and data about the archaeological / cultural heritage feature/site.</p> <p>Positive: Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial)</p>
Low	<p>Negative: Some measurable change in attributes, quality or vulnerability, minor loss or, or alteration to, one (maybe more) key characteristics, features or elements (Adverse) A moderate direct impact arises where a change to the site is proposed which though noticeable is not such that the archaeological / cultural heritage integrity of the site is compromised and which is reversible. This arises where an archaeological / cultural heritage feature can be incorporated into a modern-day development without damage and that all procedures used to facilitate this are reversible.</p> <p>Positive: Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial)</p>
Negligible	<p>Negative: Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). An impact capable of measurement but without noticeable consequences.</p> <p>Positive: Very minor benefit to, or positive addition of one or more characteristics, features or elements (Beneficial)</p>

Table 7.5 Definition of terms relating to the magnitude of an impact

An evaluation of the sensitivity (value/significance) of Cultural Heritage monuments, sites and features is based on the extent to which the assets/resources contribute to the archaeological or architectural heritage character, though their individual or group qualities, either directly or potentially and guided by legislation, national policies, acknowledged standards and designations. Table 7.6 below, based on standard authorities and guidelines, presents the criteria for defining sensitivity on Cultural Heritage assets/resources.

Sensitivity	Definition
Very High	<ul style="list-style-type: none"> • Sites of international significance: World Heritage Sites • National Monuments • Protected Structures of international and national importance • Designed landscapes and gardens of national importance • Assets of acknowledged international importance or that can contribute significantly to international and national research objectives
High	<ul style="list-style-type: none"> • RMP / SMR sites • Designated assets that contribute to regional research objectives • Protected Structures of regional importance
Medium	<ul style="list-style-type: none"> • Recently / newly identified archaeological sites (not yet included on the SMR / RMP; the importance of the resource has yet to be fully ascertained) • Undesignated assets that contribute to regional research objectives • NIAH Building Survey and Garden Survey Sites
Low	<ul style="list-style-type: none"> • Undesignated Sites of local importance (e.g. townland / field boundaries) • Assets compromised by poor preservation and/or poor survival of contextual associations • Assets of limited value but with the potential to contribute to local research objectives (e.g. potential buried foundations associated with features / structures shown the 1st edition OS six-inch mapping) • Historic townscapes or built up areas of limited historic integrity in their building or their settings
Negligible	<ul style="list-style-type: none"> • Assets with very little or no surviving archaeological interest. • Buildings of no architectural or historic note
Unknown	<ul style="list-style-type: none"> • The nature of the resource has yet to be fully ascertained, e.g. sites or areas of specific archaeological potential, greenfield areas or riverine / stream / coastal environs with inherent archaeological potential. • Structures with potential historic significance (possibly hidden or inaccessible).

Table 7.6 Definition of terms relating to the scale of sensitivity

The significance of the effect upon Cultural Heritage is determined by correlating the magnitude of the impact and the sensitivity of the receptor. The following Table 7.7 (from EPA, 2017, Table 3.3) provides the baseline criteria used to describe the impacts (effects) that the proposed development will have on Cultural Heritage Sites, Structures and Features.

Significance of Effects	<p>Imperceptible An effect capable of measurement but without significant consequences.</p> <p>Not significant An effect which causes noticeable changes in the character of the environment but without significant consequences.</p> <p>Slight Effects An effect which causes noticeable changes in the character of the environment without affecting its sensitivities.</p> <p>Moderate Effects An effect that alters the character of the environment in a manner that is consistent with existing and emerging baseline trends.</p> <p>Significant Effects An effect which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.</p> <p>Very Significant An effect which, by its character, magnitude, duration or intensity significantly alters most of a sensitive aspect of the environment.</p> <p>Profound Effects An effect which obliterates sensitive characteristics</p>
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7.7 Baseline Criteria & Impacts

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APPENDIX 7-2

Classification of Archaeological Monuments

The following list is based in the Class List Definitions of the Archaeological Survey of Ireland

Burnt Mound	A circular or irregularly shaped mound of material consisting of burnt stones, ash and charcoal with no surface evidence of a trough or depression. Levelled examples can appear as a spread containing burnt stones. These can be of any date from the Bronze Age (c. 2400-500 BC) to the early medieval period (5th - 12th century AD).
Castle - unclassified	A castle that cannot be more precisely classified. They can date from the late 12th to the 16th century AD.
Church	A building used for public Christian worship. These can be of any date from c. 500 AD onwards.
Font	A vessel, usually made of stone, over which baptisms were held. These date from the medieval period (5th-16th centuries AD) onwards.
Graveyard	The burial area around a church. These date from the medieval period (5th-16th centuries) onwards.
Souterrain	An underground structure consisting of one or more chambers connected by narrow passages or creepways, usually constructed of dry-stone walling with lintelled roof over the passages and a corbelled roof over the chambers. Most souterrains appear to have been built in the early medieval period (c. 500-1000 AD) by ringfort inhabitants as a defensive feature and/or storage.

APPENDIX 7-3

Descriptions of Monuments listed in Archaeological Inventory (Table 7.2)

The following is based on descriptions in the SMR (www.archaeology.ie)

SITE CH-1

SMR No:
KK031-034
TOWNLAND:
Ballyhale

This monument comprises four individual elements, all located within a Zone of Archaeological Potential/Notification – Figure 7.6 above

1a – KK031-034001; Church: Protection: RMP; KCDP

As noted above in Section 7.3.1, the church of Kiltorcan (Ballyhale) was appropriated to Kells Priory, probably sometime in the 13th century. Following the reformation in the sixteenth century, the church was suppressed and fell into decay. In around 1750 when this former church site at Ballyhale was secured and a chapel constructed; this was partially destroyed following a fire but was repaired sometime from 1796 to 1801, with further rebuilding/repairs undertaken in 1804. In 1855, the Catholic church was further rebuilt, 'almost from its foundations', and dedicated to St. Martin of Tours.

All that remains of the medieval church is a tower positioned on the western side of the 19th century church. It comprises five stories, with a vault over the ground floor, with base dimensions of 7.4m N-S x 5.8m E-W and incorporates a base-batter to a height of 2.6m. On the ground floor, the original 1.2m wide doorway is on the western side and set back from the batter; some rebuilding is evident over the door. There is a loop-window at the NW corner giving light to a mural stairs. Access to the vault is not possible. There is an ogee-headed window set into the western wall at first-floor level within and internal doorway from spiral mural stairs, with corbel edging; on north wall is a small embrasure to a tall loop and a hole through the floor to the chamber over the vault. On the east wall is a rebuilt window, plastered from within church and on the south wall is a small embrasure with loop; this floor measures 4.8m (N-S) x 3.3m E-W.

1b– KK031-034002; Graveyard; Protection: RMP; KCDP

There is a graveyard positioned around the southern and eastern sides of the present church bounded by relatively modern walls on all sides. There is a possibility that any graveyard associated with the medieval church extends outside these existing, particularly to the west and north. The river/stream channel to the west was created in the 20th century.

1c – KK031-034004; Font; Protection: RMP; KCDP

A font is built into the wall of the medieval tower and comprises nine Romanesque flutes, on two tiers, with a staggered bottom tier. Internally, the bowl is cylindrical to the front face and it has no drain.

1d– KK031-034005; Castle-unclassified; Protection: KCDP

The medieval church tower is known locally as 'Ballyhale Castle' and is marked as such on O.S. historic maps. There are no historical references to a castle at Ballyhale.

SITE CH-2

SMR No:
KK031-070
TOWNLAND:
Ballyhale
CLASSIFICATION:
Souterrain
PROTECTION:
RMP; KCDP

In pasture on the S side of the road leading W out of Ballyhale village. A souterrain in a hollow near a stream was noted during a field inspection in 1989. A large capstone with other smaller stones around it was described and the passage appeared to extend NW-SE but was inaccessible. Test-trenching in the same area in 2007 in advance of a proposed housing scheme (Licence no. 07E0524) revealed two subterranean features comprising boulder and sandstone walls topped with flatter, well-laid capstones at a depth of 1.8m beneath the present ground surface. Although the construction is of the style associated with souterrains the dimensions were very small (Wth 0.6m; H 0.6m). The passages may have been associated with an adjacent 19th century mill

SITE CH-3**SMR No:**

KK031-090

TOWNLAND:

Ballyhale

CLASSIFICATION:

Burnt Mound

PROTECTION:

RMP; KCDP

A burnt mound was revealed during test-trenching in advance of a proposed residential construction (Excavation licence no. 07E0524). The mound (c. 16.2m x 13.4m) comprised frequent to abundant small to medium pieces of rounded sandstone and large quantities of angular burnt stone and some charcoal flecks. Plough furrows had spread the material N and S (the dimensions cited include this spreading)

Descriptions of Structures listed in Architectural Inventory (Table 7.4)

Information sourced from NIAH (www.buildingsofireland.ie) and Ballyhale Local Area Plan 2004.

SITE CH-1

TOWNLAND: Ballyhale
1a – Church; RPS No: C2; NIAH No: 122003
Catholic Church of St. Martin of Tours

Detached four-bay double-height Catholic church, reconstructed 1855, on a cruciform plan incorporating fabric of earlier chapel, 1804, comprising two-bay double-height nave with single-bay single-storey lean-to projecting porch to north, single-bay double-height transepts to east and to west having single-bay four-stage medieval tower house, c.1550, to west on a square plan adapted as bell tower, single-bay double height chancel to south having single-bay single-storey lean-to flanking chapels, and single-bay single-storey sacristy to south. Reroofed, pre-1973. Pitched roofs on a cruciform plan (lean-to to porch and to flanking chapels; pitched to sacristy) with replacement slate, pre-1973, clay ridge tiles, cut-stone coping to gables having cross finials to apexes, and cast-iron rainwater goods on rendered eaves. Roof to tower not visible behind parapet with cast-iron bell in iron frame. Unpainted roughcast walls with cut-limestone surrounds to gables forming 'open bed pediments', and random rubble stone walls to tower having slight batter with battlemented parapet on stringcourse having corner pinnacles. Pointed-arch window openings (grouped in tripartite arrangement to chancel) with cut-limestone sills, some having timber Y-mullions forming bipartite lancet arrangement, and fixed-pane fittings having leaded stained glass panels. Pointed-arch apertures to tower (some paired) with cut-stone surrounds having chamfered reveals, and fittings not discernible. Pointed segmental-headed door opening to porch with tongue-and-groove timber panelled double doors. Pointed-arch door opening to transept to east with tongue-and-groove timber panelled door. Interior with decorative clay tiling to porch, full-height interior to nave open into roof with timber floors, timber pews, carved timber Gothic-style stations, pointed-arch panelled timber panelled wainscoting, timber panelled gallery to first floor to west incorporating dentilated moulded cornice, timber panelled confessional/internal porch units to transepts (with timber panelled half-doors to breakfronts to confessionals having timber panelled flanking doors; glazed timber panelled double doors to porches supporting shared panelled parapet having carved coping), pointed-arch panelled reredos (incorporating pointed-arch door openings having timber panelled doors incorporating 'Y-mullions') with frieze, decorative cresting, pointed-arches to side chapels having chamfered reveals (cut-limestone baptismal font to left on a cylindrical pedestal), and pointed-arch vaulted coffered ceiling incorporating ribs on consoles. Set back from road in own grounds. (ii) Graveyard to site with various cut-stone markers, post-1804-present. (iii) Gateway, c.1900, comprising pair of open work wrought iron piers having wrought iron double gates, and wrought iron flanking pedestrian gate leading to unpainted rendered pier having rendered capping.

Appraisal

A well-composed church forming an attractive landmark in the centre of Ballyhale: the church is particularly identifiable in the landscape on account of the stout tower adapted from the medieval Ballyhale Castle, thereby representing an important element of the archaeological heritage of the area. Attributes including the substantial scale, the evolved footprint improving on a modest barn-style form, and so on all attest to the growing prosperity of the local congregation in the mid nineteenth century: however, the reserved decorative treatment highlights the importance placed on functionality over ostentatious aspirations following Emancipation (1829). In contrast, a carefully maintained interior exhibits a rich decorative scheme including carved timber fittings displaying expert carpentry or craftsmanship, delicate stained glass panels of artistic interest, and so on. Positioned in the centre of an attractive graveyard containing a number of markers of design interest displaying high quality stone masonry the church makes a pleasing impression on the visual appeal of the townscape.

1d – Tower House; RPS No: C1

See Sites Ch-1a & 1b in Appendix 7-3

SITE CH-4

TOWNLAND:
Ballyhale

CH-4; Row of two-storey houses; RPS No: C3

Good continuous row of houses on east side of street.

Some are included in NIAH, as follows:

CH-4a; House; Part of RPS No: C3; NIAH No: 1232205

End-of-terrace four-bay two-storey house with dormer attic, c.1900, possibly incorporating fabric of earlier house, c.1800. Pitched slate roof with clay ridge tiles, red brick Running bond chimney stacks, and cast-iron rainwater goods on rendered eaves. Unpainted rendered, ruled and lined walls with rendered quoins to ends. Square-headed window openings with cut-limestone sills, rendered surrounds, and one-over-one timber sash windows having timber casement window to dormer attic. Square-headed door opening with rendered surround, and replacement glazed timber panelled door, c.1950. Set back from line of road with tarmacadam verge to front. (ii) Detached four-bay single-storey outbuilding with attic, c.1900, to north with square-headed carriageway to left. Pitched slate roof with clay ridge tiles, rendered coping, and cast-iron rainwater goods on rendered eaves. Unpainted fine roughcast walls over random rubble limestone construction. Square-headed window openings in shallow camber-headed recesses with no sills, red brick voussoirs, and timber fittings. Square-headed door opening with red brick voussoirs, and timber boarded door. Square-headed carriageway to left with painted replacement corrugated-iron door, c.1975. (iii) Detached two-bay single-storey outbuilding with half-attic, c.1875, to north-east with two-bay single-storey wing to left having square-headed carriageway. Pitched slate roofs with clay ridge tiles, and remains of cast-iron rainwater goods on rendered squared rubble stone or red brick eaves. Unpainted fine roughcast walls over random rubble limestone construction. Square-headed window openings (some slit-style) with no sills, concealed dressings, and timber fittings. Square-headed door opening with concealed dressings, and timber boarded door. Square-headed carriageway with timber lintel, and no fittings.

Appraisal

A pleasant middle-size house identified in the streetscape by the distinctive massing whereby the bias of solid to void is considerable. Subtle rendered dressings contribute variety to an otherwise austere detailed composition while the retention of most of the historic fabric enhances the character of the house. The survival of a range of modest-scale attendant outbuildings contributes positively to the group and setting values of the site in the street scene.

CH-4d; House; Part of RPS No: C3; NIAH No: 1232001

End-of-terrace five-bay two-storey house, c.1875, possibly incorporating fabric of earlier house, c.1775. Pitched slate roof with clay ridge tiles, red brick Running bond chimney stacks having yellow brick courses, rendered coping, and cast-iron rainwater goods on rendered eaves. Ivy-clad unpainted rendered, ruled and lined walls with vermiculated quoined piers to ends. Square-headed window openings with cut-limestone sills, and one-over-one timber sash windows. Square-headed door opening with rendered channelled surround having vermiculated panels, keystone, and timber panelled door having overlight. Interior with timber panelled shutters to window openings. Set back from line of road with tarmacadam verge to front. (ii) Detached three-bay two-storey rubble stone outbuilding, c.1875, to east with segmental-headed carriageway to left ground floor. Pitched slate roof with clay ridge tiles, and no rainwater goods on squared rubble stone eaves. Random rubble stone walls. Square apertures to eaves level with no fittings. Segmental-headed carriageway to left ground floor with red brick voussoirs.

Appraisal

A pleasant middle-size house of informal appearance on account of the seemingly-random distribution of the openings. Subtle details including the vermiculated panels contribute to the architectural design value of the composition while the combination of red and yellow brick in the chimney stacks introduces a touch of polychromy to an otherwise sombre composition. Presenting an early aspect with the essential attributes intact together with most of the original fabric the house enhances the historic quality of the streetscape while an attendant outbuilding contributes attractively to the group and setting values of the site.

SITE CH-5

RPS No:

C5 (also part of C3)

TOWNLAND:

Ballyhale

Walsh's Bar

Four-bay, two-storey house with rectangular plan and single-bay properties added on either side. Roof is single span pitched with natural slates. Rendering has been stripped off leaving coursed-rubble exposed. Small sash windows with single panes in each sash

SITE CH-6

RPS No:

C544

NIAH Reg No:

12322006

TOWNLAND:

Ballyhale

House

Detached three-bay single-storey building, c.1900, with single-bay single-storey gabled projecting lower porch to centre. Now disused. Hipped slate roof (gabled to porch) with clay ridge tiles, roughcast chimney stack having stepped coping, rendered coping to gable, and cast-iron rainwater goods on rendered eaves. Painted rendered, ruled and lined walls. Square-headed window openings with cut-stone sills, and six-over-six timber sash windows having fixed-pane timber windows to porch. Square-headed door opening with glazed tongue-and-groove timber panelled double doors. Set back from line of road with tarmacadam verge to front.

Appraisal

A pleasant small-scale building formally composed on a symmetrical plan retaining the original form and massing together with substantial quantities of the historic fabric. Possibly originally built as a gate lodge or school the building survives as an attractive feature in the streetscape.

SITE CH-7

RPS No:

C865

NIAH Reg No:

12322007

TOWNLAND:

Ballyhale

Parochial House

Detached three-bay two-storey parochial house, c.1900, on a symmetrical plan with single-bay single-storey flat-roofed projecting porch to centre, single-bay two-storey side elevations, and single-bay two-storey lean-to lower return to east. Hipped slate roof (continuing into lean-to to return) with clay ridge tiles, rendered chimney stacks having stepped coping, and cast-iron rainwater goods on rendered eaves. Flat roof to porch not visible behind parapet. Unpainted rendered walls with moulded rendered cornice to parapet to porch. Square-headed window openings with cut-limestone sills, and one-over-one timber sash windows. Camber-headed door opening with timber panelled door having overlight. Interior with timber panelled shutters to window openings. Set back from road in own grounds with roughcast boundary wall to perimeter of site. (ii) Detached six-bay single-storey outbuilding with half-attic, c.1900, to east with pair of square-headed carriageways to centre ground floor. Pitched slate roof with clay ridge tiles, ivy-clad chimney stack, and cast-iron rainwater goods on rendered eaves. Unpainted fine roughcast walls. Square-headed window opening to ground floor with cut-limestone sill, and fixed-pane timber window. Square-headed slit-style apertures to half-attic with fittings not visible. Square-headed door openings (including one to half-attic on cut-limestone sill) with tongue-and-groove timber panelled doors. Pair of square-headed carriageways to centre ground floor with tongue-and-groove timber panelled double doors having iron rolling door, c.1975, to one carriageway.

Appraisal

A well-composed middle-size house of sombre appearance forming a handsome feature in the centre of Ballyhale. The retention of the original form and massing together with substantial quantities of the early fabric both to the exterior and to the interior significantly enhances the character of the composition while the survival of an attendant outbuilding contributes pleasantly to the group and setting values of the site in the townscape.

SITE CH-8

RPS No:

C864

NIAH Reg No:

12322002

TOWNLAND:

Ballyhale

Bridge

Single-arch rubble stone road bridge over stream, c.1800, with single-span section to east. Random rubble stone walls with rubble stone vertical coping to parapets. Single round arch with squared rubble stone voussoirs, and rubble stone soffits having render over. Single flat span with dressed stone lintel. Sited spanning Ballyhale Stream with random rubble stone retaining wall to stream having rubble stone coping.

Appraisal

An attractive bridge representing an important component of the civil engineering heritage of Ballyhale. The juxtaposition of an arch and a span together with the construction in unrefined rubble stone all serve to produce a modest rustic quality in the composition that assimilates pleasantly into the surrounding landscape.

SITE CH-9

RPS No:

C866

NIAH Reg No:

12322008

TOWNLAND:

Ballyhale

Ballyhale Bridge

Two-arch rubble stone road bridge over river, c.1800. Random rubble stone walls with rubble stone coping to parapets. Pair of segmental arches with rubble stone voussoirs, and rubble stone soffits having render over. Sited spanning Ballyhale Stream with grass banks to stream.

Appraisal

A picturesque low-slung bridge forming an important element of the civil engineering heritage of Ballyhale. The construction in unrefined rubble stone produces an attractive textured, almost rustic visual effect serving to integrate the bridge pleasantly into the surrounding semi-rural landscape.

SITE CH-10

RPS No:

C867

NIAH Reg No:

12322009

TOWNLAND:

Ballyhale

Farm House

Detached three-bay two-storey farmhouse, c.1800. Refenestrated, c.1925. Extensively renovated. Pitched roof with replacement artificial slate, clay ridge tiles, rendered chimney stacks having rendered stringcourses, and replacement uPVC rainwater goods on stepped eaves. Painted rendered, ruled and lined walls with rendered quoined piers to ends. Square-headed window openings with cut-stone sills, and replacement one-over-one timber sash windows, c.1925. Segmental-headed door opening with rendered surround having keystone, replacement timber panelled door having sidelights, and overlight. Interior with timber panelled reveals/shutters to window openings. Set back from road in own grounds with unpainted roughcast boundary wall having painted rendered piers, and iron double gates. (ii) Attached three-bay single-storey outbuilding with dormer attic, c.1800, to east on an L-shaped plan with two-bay single-storey projecting bay to right. Extensively renovated to accommodate residential use. Pitched slate roofs with clay ridge tiles, rendered chimney stack, rendered coping, rooflights, and replacement uPVC rainwater goods on rendered eaves. Part ivy-clad unpainted replacement roughcast walls. Square-headed window openings with cut-stone sills, and one-over-one timber sash windows having timber casement window to front (south) elevation. Square-headed door openings with replacement tongue-and-groove timber panelled doors having sidelight. (iii) Detached four-bay single-storey outbuilding with attic, c.1850, to north. Reroofed. Pitched roof with replacement corrugated-iron, iron ridges, and no rainwater goods on squared rubble limestone eaves. Random rubble stone walls. Square-headed window openings with no sills, timber lintels, and timber fittings. Square-headed door openings with timber lintels, and timber boarded doors.

Appraisal

A pleasant modest-scale house retaining most of the original composition attributes together with substantial quantities of the historic fabric both to the exterior and to the interior. An attendant outbuilding range having been sympathetically adapted to an alternative use enhances the visual appeal of the site while the survival of further ancillary ranges contributes to the group and setting values of a site forming an appealing feature in the outskirts of Ballyhale.

SITE CH-11**NIAH Reg No:**

12322004

TOWNLAND:

Ballyhale

Water Pump

Freestanding cast-iron water pump, c.1875, comprising banded cylindrical shaft having moulded necking, fluted cylindrical head having spout, curvilinear 'cow tail' handle, and moulded domed capping having finial. Now disused. Set back from line of road on cut-limestone base.

Appraisal

A pleasant, if discreet feature in the streetscape representing an important example of early mass-produced cast-iron ware. Embossed and raised details indicate the artistic design aspirations of the composition: however, intended primarily as a functional piece the water pump is of particular interest as evidence of the mechanisms put in place for the provision of clean water from a local source or well before the development of mains systems.

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8 Landscape and Visual

8.1 Introduction

The **Landscape and Visual** Assessment has been completed by Evelyn Sikora BA, MA, a qualified Landscape Architect with a degree (Edinburgh College of Art 2006). She also holds a Master's in Planning and Sustainable Development (UCC, 2010) and is a member of the Irish Landscape Institute. Evelyn has over six years' experience in Landscape and Visual Assessment (LVIA) and has experience in a range of projects throughout Ireland. These include a number of infrastructural projects including road schemes, flood relief projects, telecommunications, quarry developments, wind farms, solar farms, water abstraction projects and residential and commercial development, in both rural and urban contexts. Report oversight has been provided by Declan O' Leary, LIPI CMLI, Managing Director CSR who has 25 years' experience in LVIA.

8.2 Assessment Methodology

Ireland is a signatory to the European Landscape Convention (ELC). The ELC defines landscape as 'an area, as perceived by people, whose character is the result of the action and interaction of natural and/or human factors'. This definition is important in that it expands beyond the idea that landscape is only a matter of aesthetics and visual amenity. It encourages a focus on landscape as a resource in its own right - a shared resource providing a complex range of cultural, environmental, and economic benefits to individuals and society.

As a cultural resource, the landscape functions as the setting for our day-to-day lives, also providing opportunities for recreation and aesthetic enjoyment and inspiration. It contributes to the sense of place experienced by individuals and communities and provides a link to the past as a record of historic socio-economic and environmental conditions. As an environmental resource, the landscape provides habitat for fauna and flora. It receives, stores, conveys and cleans water, and vegetation in the landscape stores carbon and produces oxygen. As an economic resource, the landscape provides the raw materials and space for the production of food, materials (e.g. timber, aggregates) and energy (e.g. carbon-based fuels, wind, solar), living space and for recreation and tourism activities.

Forces for Landscape Change

The Guidelines on Landscape and Visual Assessment, 3rd Edition (GLVIA) notes that landscape is not unchanging, and that many different pressures have progressively altered familiar landscapes over time and will continue to do so in the future, creating new landscapes. For example, within the receiving environment, the environs of the proposed development have altered over the last thousand years, from wilderness to agriculture and settlement.

It also notes that many of the drivers for change arise from the requirement for development to meet the needs of a growing population and economy. The concept of sustainable development recognises that change must and will occur to meet the needs of the present, but that it should not compromise the ability of future generations to meet their needs. This involves finding an appropriate balance between economic, social and environmental forces and values.

The reversibility of change is an important consideration. If change must occur to meet a current need, can it be reversed to return the resource (in this case, the landscape) to its previous state to allow for development or management for future needs.

The GLVIA also notes that climate change is one of the major factors likely to bring about future change in the landscape, and it is accepted to be the most serious long-term threat to the natural environment, as well as economic activity (particularly primary production) and society. The need for climate change mitigation and adaptation, which includes the management of water and more extreme weather and rainfall patterns, is part of this.

8.2.1 *Guidance*

Landscape and Visual Impact Assessment (LVIA) is a tool used to identify and assess the significance of and the effects of change resulting from development on both the landscape as an environmental resource in its own right and on people's views and visual amenity.

The methodology for assessment of the landscape and visual effects is informed by the following key guidance documents, namely:

- *Guidelines for Landscape and Visual Impact Assessment, 3rd Edition 2013, published by the UK Landscape Institute and the Institute of Environmental Management and Assessment (hereafter referred to as the GLVIA).*
- *Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (Draft August 2017)*

References are also made to the 'Landscape and Landscape Assessment – Consultation Draft of Guidelines for Planning Authorities' document, published in 2000 by the Department of Environment, Heritage and Local Government.

Use of the Term 'Effect' vs 'Impact'

The GLVIA advises that the terms 'impact' and 'effect' should be clearly distinguished and consistently used in the preparation of an LVIA.

'Impact' is defined as the action being taken. In the case of the proposed works, the impact would include the construction of the proposed development.

'Effect' is defined as the change or changes resulting from those actions, e.g. a change in landscape character, or changes to the composition, character and quality of views in the receiving environment. This report focusses on these effects.

Assessment of Both 'Landscape' and 'Visual' Effects

Another key distinction to make in a LVIA is that between landscape effects and the visual effects of development.

'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.

8.2.2 Methodology for Landscape Assessment

In Section 8.5 of this report *the potential* landscape effects of the development are assessed. Landscape impact assessment considers the likely nature and scale of changes to the main landscape elements and characteristics, and the consequential effect on landscape character and value. Existing trends of change in the landscape are taken into account. The potential effect is assessed based on measurement of the landscape sensitivity against the magnitude of change which would result from the development.

Sensitivity of the Landscape Resource

Landscape Sensitivity: Landscape sensitivity is a function of its land use, landscape patterns and scale, visual enclosure and distribution of visual receptors, scope for mitigation, and the value placed on the landscape. It also relates to the nature and scale of development proposed. It includes consideration of landscape values as well as the susceptibility of the landscape to the proposed change.

Landscape values can be identified by the presence of landscape designations or policies which indicate particular values, either on a national or local level. In addition, a number of criteria are used to assess the value of a landscape.

Landscape susceptibility is defined in the GLVIA as the ability of the landscape receptor to accommodate the proposed development without undue consequences for the maintenance of the baseline scenario and/or the achievement of landscape planning policies and strategies.

Susceptibility also relates to the type of development – a landscape may be highly susceptible to certain types of development but have a low susceptibility to other types of development.

Sensitivity is therefore a combination of Landscape value and Susceptibility.

For the purpose of assessment, five categories are used to classify the landscape sensitivity of the receiving environment.

Sensitivity	Description
Very High	Areas where the landscape exhibits a very strong, positive character with valued elements, features and characteristics that combine to give an experience of unity, richness and harmony. The character of the landscape is such that its capacity for accommodating change in the form of development is very low. These attributes are recognised in landscape policy or designations as being of national or international value and the principle management objective for the area is protection of the existing character from change
High	Areas where the landscape exhibits strong, positive character with valued elements, features and characteristics. The character of the landscape is such that it has limited/low capacity for accommodating change in the form of development. These attributes are recognised in landscape policy or designations as being of national, regional or county value and the principle management objective for the area is conservation of the existing character.
Medium	Areas where the landscape has certain valued elements, features or characteristics but where the character is mixed or not particularly strong. The character of the landscape is such that there is some capacity for change in the form of development. These areas may be recognised in landscape policy at local or county level and the principle management objective may be to consolidate landscape character or facilitate appropriate, necessary change
Low	Areas where the landscape has few valued elements, features or characteristics and the character is weak. The character of the landscape is such that it has capacity for change; where development would make no significant change or would make a positive change. Such landscapes are generally unrecognised in policy and where the principle management objective is to facilitate change through development, repair, restoration or enhancement.
Negligible	Areas where the landscape exhibits negative character, with no valued elements, features or characteristics. The character of the landscape is such that its capacity for accommodating change is high; where development would make no significant change or would make a positive change. Such landscapes include derelict industrial lands or extraction sites, as well as sites or areas that are designated for a particular type of development. The principle management objective for the area is to facilitate change in the landscape through development, repair or restoration.

Table 8-1: Categories of Landscape Sensitivity

Magnitude of Landscape Change

The magnitude of change is a factor of the scale, extent and degree of change imposed on the landscape with reference to its key elements, features and characteristics (also known as ‘landscape receptors’). Five categories are used to classify magnitude of landscape change.

Magnitude of Change	Description
Very High	Change that is large in extent, resulting in the loss of or major alteration to key elements, features or characteristics of the landscape (i.e. landscape receptors), and/or introduction of large elements considered totally uncharacteristic in the context. Such development results in fundamental change in the character of the landscape with loss of landscape quality and perceived value.
High	Change that is moderate to large in extent, resulting in major alteration or compromise of important landscape receptors, and/or introduction of large elements considered uncharacteristic in the context. Such development results in change to the character of the landscape with loss of landscape quality and perceived value.
Medium	Change that is moderate in extent, resulting in partial loss or alteration of landscape receptors, and/or introduction of elements that may be prominent but not necessarily substantially uncharacteristic in the context. Such development results in change to the character of the landscape but not necessarily reduction in landscape quality and perceived value.
Low	Change that is moderate or limited in scale, resulting in minor alteration of landscape receptors, and/or introduction of elements that are not uncharacteristic in the context. Such development results in minor change to the character of the landscape and no reduction in landscape quality and perceived value.
Negligible	Change that is limited in scale, resulting in no alteration to landscape receptors, and/or introduction of elements that are characteristic of the context. Such development results in no change to the landscape character, quality or perceived value

Table 8-2 Magnitude of Landscape Change

Significance of Effects

In order to classify the significance of effects, the predicted magnitude of change is measured against the sensitivity of the landscape/viewpoint, using the following guide, from the EPA Draft Guidance (2017).

There are seven classifications of significance, namely: (1) imperceptible, (2) not significant, (3) slight, (4) moderate, (5) significant, (6) very significant, (7) profound

		Sensitivity of the Resource				
		Very High	High	Medium	Low	Negligible
Magnitude of Change	Very High	Profound	Profound-Very Significant	Very Significant-Significant	Moderate	Slight
	High	Profound-Very Significant	Very Significant	Significant	Moderate-Slight	Slight-Not Significant
	Medium	Very Significant-Significant	Significant	Moderate	Slight	Not Significant
	Low	Moderate	Moderate-Slight	Slight	Not significant	Imperceptible
	Negligible	Slight	Slight-Not Significant	Not significant	Imperceptible	Imperceptible

Table 8-3: Significance of Effects

The matrix above is used as a guide only. The assessor also uses professional judgement informed by their expertise, experience and common sense, to arrive at a classification of significance that is reasonable and justifiable.

Landscape effects are also classified as positive, neutral or negative/adverse. Development has the potential to improve the environment as well as damage it. In certain situations, there might be policy encouraging a type of change in the landscape, and if a development achieves the objective of the policy the resulting effect might be positive, even if the landscape character is profoundly changed.

Methodology for Visual Assessment

In Section 8.5 of this report the potential visual effects of the development are assessed. Visual assessment considers the changes to the composition character of views, the of the views, and the visual amenity experienced by visual receptors (groups of people). The assessment is made for a number of viewpoints selected to represent the range of visual receptors in the receiving environment. The significance of the visual effects experienced at these locations is assessed by measuring the visual receptor sensitivity against the magnitude of change to the view resulting from the development.

Sensitivity of the Viewpoint/Visual Receptor

Viewpoint sensitivity is a function of two main considerations:

- Susceptibility of the visual receptor to change. This depends on the occupation or activity of the people experiencing the view, and the extent to which their attention or interest is focussed on the views or visual amenity they experience at that location.

Visual receptors most susceptible to change include residents at home, people engaged in outdoor recreation focused on the landscape (e.g. trail users), and visitors to heritage or other attractions and places of community congregation where the setting contributes to the experience.

Visual receptors less sensitive to change include travellers on road, rail and other transport routes (unless on recognised scenic routes), people engaged in outdoor recreation or sports where the surrounding landscape does not influence the experience, and people in their place of work or shopping where the setting does not influence their experience.

- Value attached to the view. This depends to a large extent on the subjective opinion of the visual receptor but also on factors such as policy and designations (e.g. scenic routes, protected views), or the view or setting being associated with a heritage asset, visitor attraction or having some other cultural status (e.g. by appearing in arts).

For the purpose of assessment, five categories are used to classify a viewpoint's sensitivity:

Sensitivity	Description
Very High	Iconic viewpoints - towards or from a landscape feature or area - that are recognised in policy or otherwise designated as being of national value. The composition, character and quality of the view are such that its capacity for accommodating change in the form of development is very low. The principle management objective for the view is its protection from change.
High	Viewpoints that that are recognised in policy or otherwise designated as being of value, or viewpoints that are highly valued by people that experience them regularly (such as views from houses or outdoor recreation features focussed on the landscape). The composition, character and quality of the view may be such that its capacity for accommodating compositional change in the form of development may or may not be low. The principle management objective for the view is its protection from change that reduces visual amenity.
Medium	Viewpoints representing people travelling through or past the affected landscape in cars or on public transport, i.e. viewing but not focused on the landscape which is regarded as moderately scenic. The views are generally not designated, but which include panoramic views or views judged to be of some scenic quality, which demonstrate some sense of naturalness, tranquillity or some rare element in the view
Low	Viewpoints reflecting people involved in activities not focused on the landscape e.g. people at their place of work or engaged in similar activities such as shopping, or on heavily trafficked routes etc. The view may present an attractive backdrop to these activities but is not regarded as particularly scenic or an important element of these activities.
Negligible	Viewpoints reflecting people involved in activities not focused on the landscape e.g. people at their place of work or engaged in similar activities such as shopping where the view has no relevance or is of poor quality.

Table 8-4: Visual Receptor Sensitivity

Magnitude of Change to the View

Classification of the magnitude of change takes into account the size or scale of the intrusion of development into the view (relative to the other elements and features in the composition, i.e. its relative visual dominance), the degree to which it contrasts or integrates with the other elements and the general character of the view, and the way in which the change will be experienced (e.g. in full view, partial or peripheral, or glimpses). It also takes into account the geographical extent of the change, the duration and the reversibility of the visual effects.

Five categories are used to classify magnitude of change to a view:

Magnitude of Change	Description
Very High	Full or extensive intrusion of the development in the view, or partial intrusion that obstructs valued features or characteristics, or introduction of elements that are completely out of character in the context, to the extent that the development becomes the dominant the composition and defines the character of the view and the visual amenity
High	Extensive intrusion of the development in the view, or partial intrusion that obstructs valued features, or introduction of elements that may be considered uncharacteristic in the context, to the extent that the development becomes co-dominant with other elements in the composition and affects the character of the view and the visual amenity.
Medium	Partial intrusion of the development in the view, or introduction of elements that may be prominent but not necessarily uncharacteristic in the context, resulting in change to the composition but not necessarily the character of the view or the visual amenity.
Low	Minor intrusion of the development into the view, or introduction of elements that are not uncharacteristic in the context, resulting in minor alteration to the composition and character of the view but no change to visual amenity
Negligible	Barely discernible intrusion of the development into the view, or introduction of elements that are characteristic in the context, resulting in slight change to the composition of the view and no change in visual amenity.

Table 8-5: Magnitude of Visual Change

Significance of Visual Effects

As for landscape effects, in order to classify the importance of visual effects, the magnitude of change to the view is measured against the sensitivity of the viewpoint.

Visual effects are also classified as positive, neutral or negative. This is an inherently subjective exercise. Visual receptors' attitudes to development of various types varies and this affects their perception of the visual effects of development.

Quality and Timescale

The predicted impacts are also classified as beneficial, neutral or adverse. This is not an absolute exercise; in particular, visual receptors' attitudes to development, and thus their response to the impact of a development, will vary. However, the methodology applied is designed to provide robust justification for the conclusions drawn. These qualitative impacts/effects are defined as:

- Adverse – Scheme at variance with landform, scale, pattern. Would degrade, diminish or destroy the integrity of valued features, elements or their setting or cause the quality of the landscape(townscape)/view to be diminished;
- Neutral - Scheme complements the scale, landform and pattern of the landscape(townscape)/view and maintains landscape quality;
- Beneficial – improves landscape(townscape)/view quality and character, fits with the scale, landform and pattern and enables the restoration of valued characteristic features or repairs / removes damage caused by existing land uses.

Impacts/effects are also categorised according to their longevity or timescale:

- Temporary – Lasting for one year or less;
- Short Term – Lasting one to seven years;
- Medium Term – Lasting seven to fifteen years;
- Long Term – Lasting fifteen years to sixty years;
- Permanent – Lasting over sixty years.

A statement is made as to the appropriateness of the proposed development based on the combined assessment of the predicted landscape and visual effects. This methodology, in accordance with the various guidelines for LVIA, results in a conclusion as to the appropriateness of the proposed development based on objective assessment of its likely landscape and visual impacts.

8.3 Baseline Environment

8.3.1 Study Area

The study area for the proposed works consists of the whole of Ballyhale village, with an emphasis on the areas where the six options are proposed.

8.3.2 Landscape Policy - Kilkenny County Development Plan 2014-2020

The Kilkenny County Development Plan 2014-2020 is hereafter referred to as the Plan Green Infrastructure

Green Infrastructure is noted in the Plan as having the following advantages:

a high-quality environment which will provide economic benefits by attracting inward investment and new business

- *high quality open spaces which provide health and social benefits for people through the provision of play areas, safe and attractive areas and routes for meeting, walking and cycling*
- *opportunities and space for contact with nature, which is considered essential for good health and wellbeing*
- *adaptation to the impacts of climate change and flooding.*
- *local food production - in allotments, gardens and through agriculture*
- *space for biodiversity (nature and wildlife) to flourish*
- *a sense of place and local distinctiveness*

The relevant objective is as follows:

Objective 8D : *To prepare and support the implementation of a Green Infrastructure Strategy for County Kilkenny, as resources allow.*

The Plan states that Kilkenny County Council has commissioned habitat assessments and Green Infrastructure surveys of a number of towns and villages throughout the county, which includes Ballyhale.

Objective 8E: *To protect and where possible enhance wildlife habitats and landscape features which act as ecological corridors/networks and stepping stones, such as river corridors, hedgerows and road verges, and to minimise the loss of habitats and features of the wider countryside (such as ponds, wetlands, trees) which are not within designated sites. Appropriate mitigation and/or compensation measures to conserve biodiversity, landscape character and green infrastructure networks will be required where habitats are at risk or lost as part of a development.*

Development Management Standards

Several Development management standards, which relevant include standards relating to woodland, hedgerow and tree retention, and planting of native species, are relevant:

- *To protect existing woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character of the county, and to ensure that proper provision is made for their protection and management, when undertaking, approving or authorising development.*
- *To ensure that when undertaking, approving or authorising development that sufficient information is provided to enable an assessment of impacts on woodlands, trees, and hedgerows.*
- *Have regard to, and seek the conservation of (a) sites of significance identified in the Kilkenny Woodlands Survey 1997, and (b) the trees of County Kilkenny identified in the Tree Register of Ireland, (c) Survey of Mature Trees in Kilkenny City and Environs in the assessment of planning applications, and (d) the National Survey of Native Woodlands and Ancient Woodlands*
- *Retain hedgerows, and other distinctive boundary treatment such as stone walls, when undertaking, approving or authorising development; where the loss of the existing boundary is unavoidable as part of development, to ensure that a new hedgerow is planted using native species, and species of local provenance to replace the existing hedgerow and/or that the wall is re-built using local stone and local vernacular design.*
- *Discourage the felling of mature trees to facilitate development.*
- *Require the planting of native broadleaved species, and species of local provenance, in new developments as appropriate. See Appendix G for a list of native trees and shrubs.*

It should be noted that the trees in Ballyhale are not included on the Tree Register of Ireland or under Tree Preservation Orders.

Objective 8F: *Kilkenny County Council will promote the planting of native tree and shrub species, by committing to using native species (of local provenance wherever possible) in its landscaping work and on County Council property.*

Inland waters and Rivers/Streams policies

The Plan states that because of their importance all rivers and streams will be maintained in open, semi-natural conditions, wherever possible. Their corridors and valleys will be protected and maintained for their biodiversity and landscape values,

including flood protection where practicable. The Development management standards include:

- *Proposals must demonstrate that they will not adversely affect any habitats and/or species of interest or compromise the river's function as a green infrastructure corridor.*

Landscape Character Areas

As noted in the Plan, the Landscape Character Assessment divides the county into four landscape character types (LCTs). These are:

- Upland Areas,
- Lowland Areas,
- River Valleys, and
- Transitional Areas.

Ballyhale is located in an area outlined as a Transitional Area, which lies between the south western uplands (Landscape Character Type C) and the lower lying lands to the north (Landscape Character Area F, Kilkenny Western Basin). This is indicated on Figure 8.2 of the Development Plan, shown overleaf.

The landscape character of this area is defined by a smooth terrain, allowing views over long distances, and vegetation is predominantly low. Land use comprises pasturelands and tree plantations, the area is described as a rural area with scattered, low density settlement patterns.

A map showing areas of Landscape Sensitivity (Figure 8.3 of the Plan) was studied, and it was not possible to identify any areas of sensitivity in the vicinity of Ballyhale. The Landscape Character Assessment notes that this landscape unit is perceived as having *no special landscape or scenic value*.

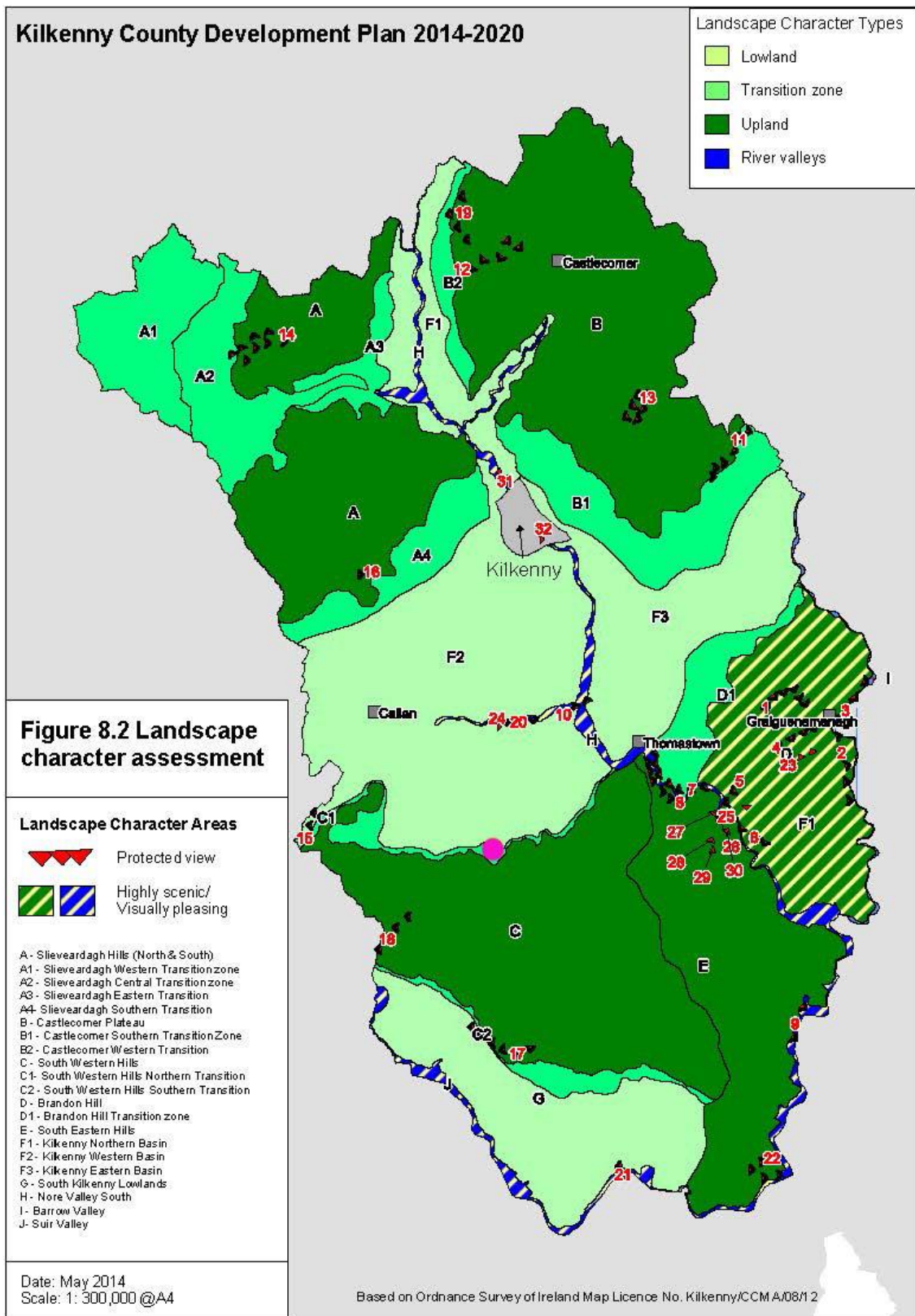


Table 8-6: Landscape Character Types Co. Kilkenny

Objective 8G : *To protect and sustainably manage the landscape character of County Kilkenny, having regard to the findings of the landscape character assessment and the development management standards as set out in this chapter for the sustainable development of the county and appropriate conservation of its landscape character.*

Views and Prospects

Figure 8.2 also indicates Views and Prospects in Co. Kilkenny. The Plan shows that there are no views/prospects in the vicinity of Ballyhale (the approximate location of the village is shown on the map by a pink dot).

8.3.3 Ballyhale LAP

The Ballyhale Local Area Plan 2004 (hereafter referred to as the LAP) were consulted. The LAP refers to the provision of open space and in particular a linear park.

Objectives relating to open space and the stream corridor

The Plan states that two areas of open space should be provided, one along the stream and one to the north of the village.

'...a small linear park shall be developed along the stream in this area linking from the N9 opposite the school through to an area to the rear of the Church.'

The LAP notes that this is envisaged as a 'meaningful route' along the stream *through the village which the provision of an access point through the residentially zoned land to the north and out to the main street.*

The LAP also notes that an area of open space shall also be provided to the north of the village, on either side of the stream's edge, to the east of the Main street, to reflect the designation of this area as an SAC.

The LAP contains the following relevant objectives:

Objective: *To provide quality open space to meet the needs of the existing and future population*

Objective: *To enhance and protect the quality of the stream, whilst maximising its amenity potential.*

Objective: *To protect the banks of the stream and develop a river walk along it, in conjunction with the relevant statutory bodies and voluntary groups*

Objective: *To prepare an Amenity scheme for the Park during the period of this plan*

Objective: *A pedestrian/cycle linkage shall be provided to link the open space area to the west of Main street and rear of the church through the land to the northwest back out to Main street as indicated on the zoning objective map*

The LAP notes that the stream that runs through Ballyhale, to the back of the Church and graveyard is an attractive feature. The section of the stream that runs to the north of the village is designated as a Special Area of Conservation (SAC site code 002162). There are opportunities to enhance the interface between the stream and development fronting onto Main street, similar to that created in the Hazelbrook development. This will assist in benefiting local wildlife.

Objective: To adopt a uniform and consistent approach for the integration of the stream into future developments fronting onto Main street.

Land Use Zoning

The LAP contains several maps, which include a zoning map, illustrated in Figure 8.1 below. This includes residential, village centre zoning along the main street, with some areas of open space zoning to the west of the main street, which include the GAA field

Land use zoning along the stream include open space/amenity recreation to the south and west of the church, along the stream corridor. Other areas along the stream corridor are zoned industrial, residential while another section of the stream corridor to the north of the village is zoned open space. Several important tree groups are also indicated. Páirc na Seamróg (the GAA Pitch) is as a large area of open space to the west of the main street and of the stream.

The LAP also includes an Ecological survey of Ballyhale, and Figure 8-2 below indicates important ecological areas. The survey notes the importance of the Ballyhale stream, and an area of ecological interest is described in the vicinity of the stream near Ballyhale castle, (now the church bell tower) and which includes the mature trees to the west of the stream.

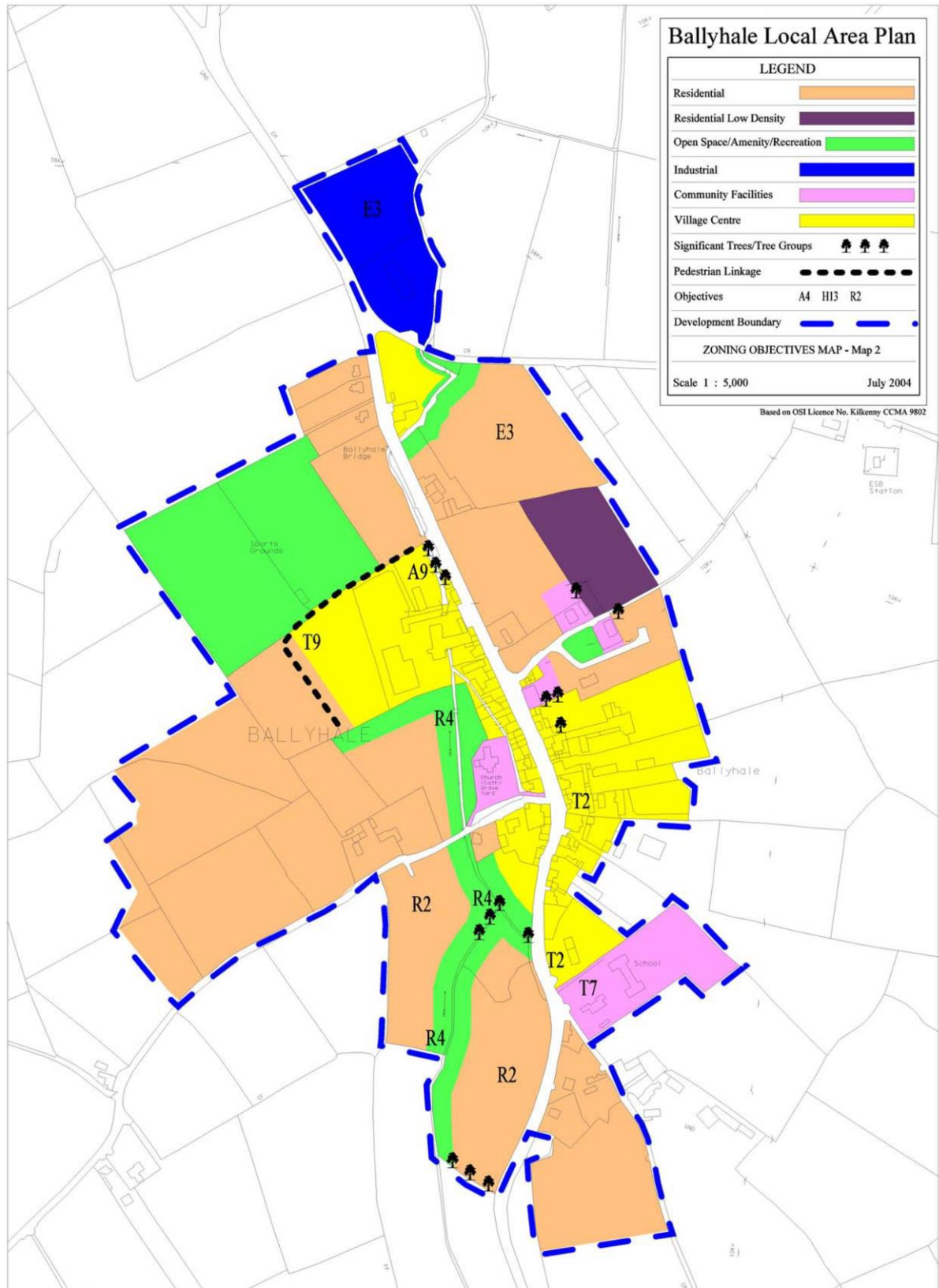


Figure 8-1: Ballyhale Zoning map

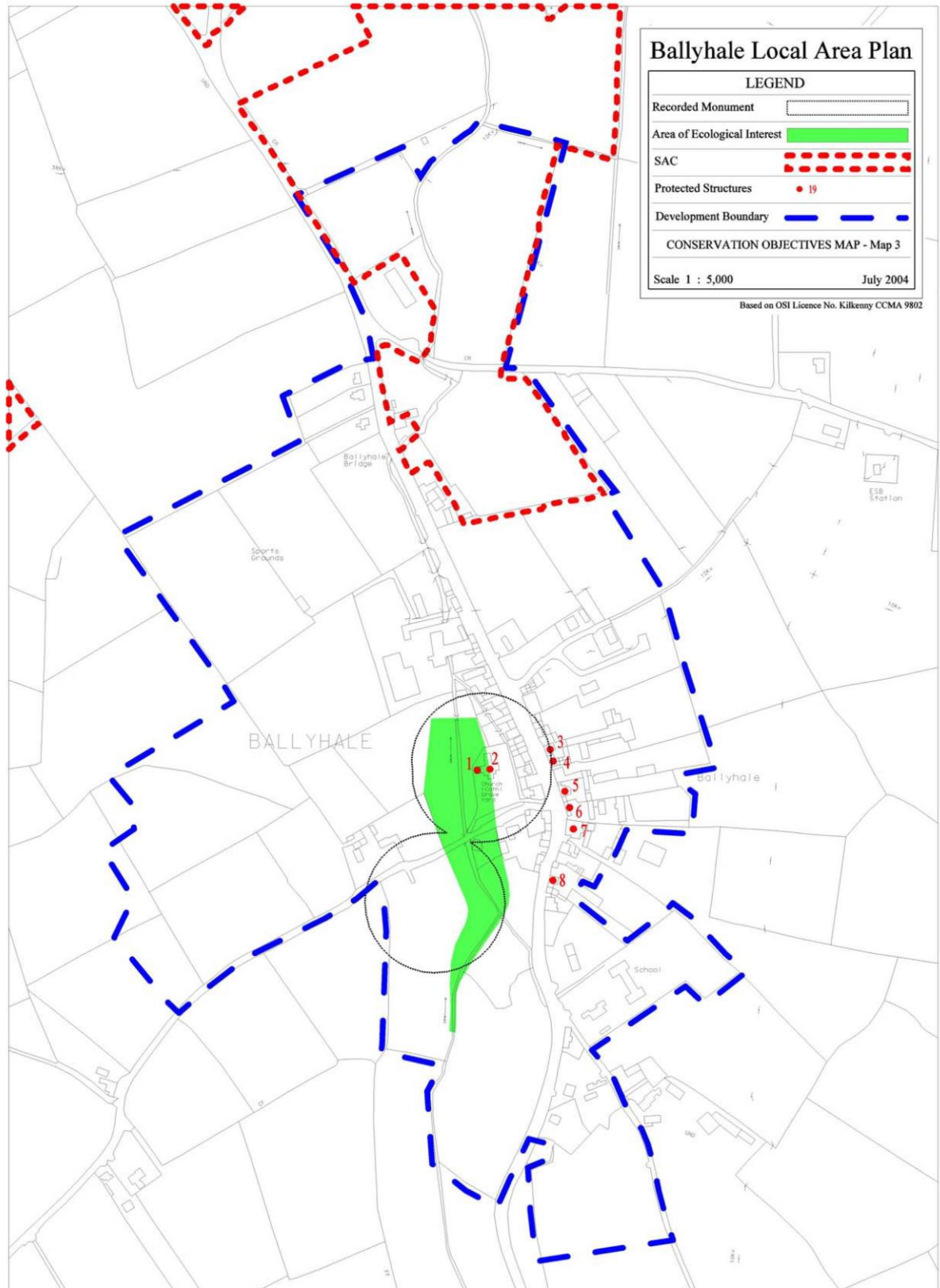


Figure 8-2: Areas of Ecological Interest

Urban Design Study

An urban design study of Ballyhale is contained in Appendix 2 of the LAP. This includes the identification of several important landscape elements, built form and open spaces, including an 'area of notable character'. This area is in the vicinity of the church, and includes the church bell tower (Ballyhale Castle), with the stream, stone wall important elements. The Study also notes the attractive nature of the stream to the west of the church, and notes its potential for inclusion in open space strategy for the village.

The Urban Design Map was produced to identify landmark buildings, focal points, significant tree groups, potential open space connections. This is included in Figure 8-3 below.

The map includes several groups of trees, including those to the west of the stream and church, and those to the south of the church in the fields. A linear open space connection is indicated to the west of the church, extending north and south. Another open space linkage is indicated north and south of the stream at the Hazelbrook residential development. An area at the northern end of the village is indicated as a prominent focal site, with a further open space connection indicated along the stream.

Views and Prospects

The Study indicates several focal views, two to the south of the town, with the most relevant view looking towards the stream as it runs through the fields south of the Church, and another at the northern edge of the village, looking towards the main street.

Summary of Landscape Policies:

- The Kilkenny County Development Plan notes the importance of a Green Infrastructure strategy and has carried out a number of ecological surveys include Ballyhale
- The Plan also seeks to protect existing woodlands, trees and hedgerows which are of amenity or biodiversity value and/or contribute to landscape character of the county
- The Kilkenny Landscape Character Assessment characterises this landscape as a Transitional Area, and does not identify any sensitive features.
- The Ballyhale LAP contains a zoning map indicating an open space linkage along the stream to the south and west of the Church, as well as to the north and south of the Hazelbrook development.

- The area in the vicinity of the Church, including the stream to the south and west, and the mature trees adjacent to the stream are identified as both an area of ecological importance and an area of important character in the LAP.

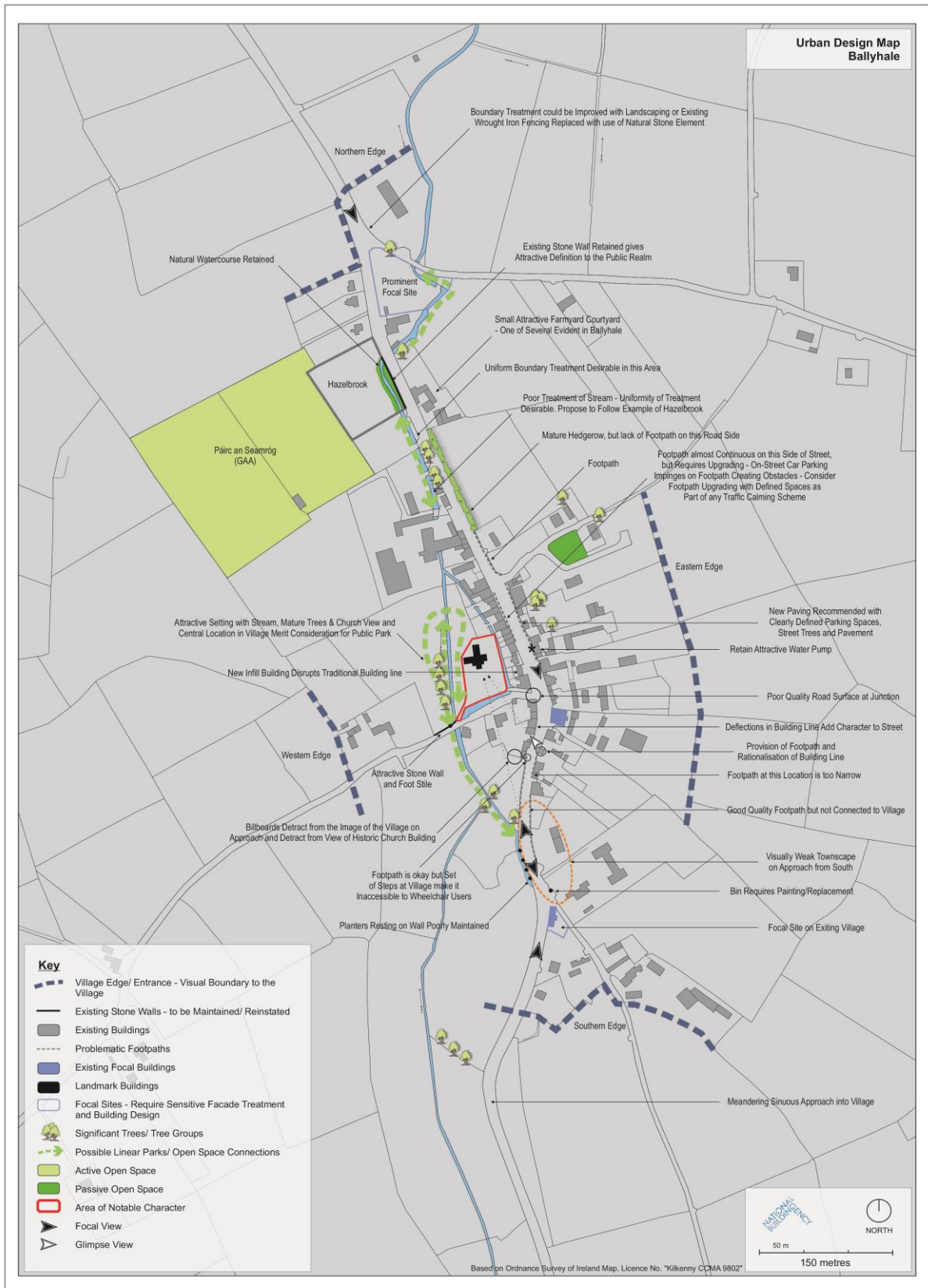


Figure 8-3: Urban Design Map

8.3.4 Receiving Environment – Landscape Character and Visual Amenity

The Landscape and visual characteristics of the site are discussed in this section.

Landform – Topography and Drainage

Ballyhale village is located in a gently rolling agricultural landscape, with some scattered small settlements in the wider landscape. Some conifer plantations are evident in the wider landscape, with arable and pasture fields evident.

The village of Ballyhale is a small and relatively compact village, with one main street running north to south. The Ballyhale stream flows north through Ballyhale, running through fields south of the village, as shown in Plate 8-1 below, to the west of the church (and a secondary channel runs to the south and east of the church and graveyard). It runs under Main Street at Ballyhale Bridge near the northern end of the village. The description of the stream and its character can be described in two main sections – the area to the south of the village, around the church and the section that runs parallel to Main Street and to the north of the village.

South of Ballyhale Village and Church environs

Plate 8-1 below shows the floodplain of the stream just south of the village.



Plate 8-1: Floodplain of stream with mature tree lines, south of Ballyhale

The stream crosses under the road south of the church, and flows along to the west of the church, as shown in Plate 8-2 below. The flow at the time of the site visit was shallow.



Plate 8-2: Ballyhale Stream continues through field west of Church

The stream then travels through the open field, west of the church, with mature trees evident in the area. The stream was not prominent at the time of the site visit, but its route is indicated by a bridge as shown in Plate 8-3 below. It continues towards the Arrigle business park, seen in the background of Plate 8-3 below.



Plate 8-3: Stream continues through open field towards business park

A small shallow secondary channel of the stream flows directly to the south of the church and graveyard, which is largely overgrown with vegetation, as shown in plate 8-4 below.

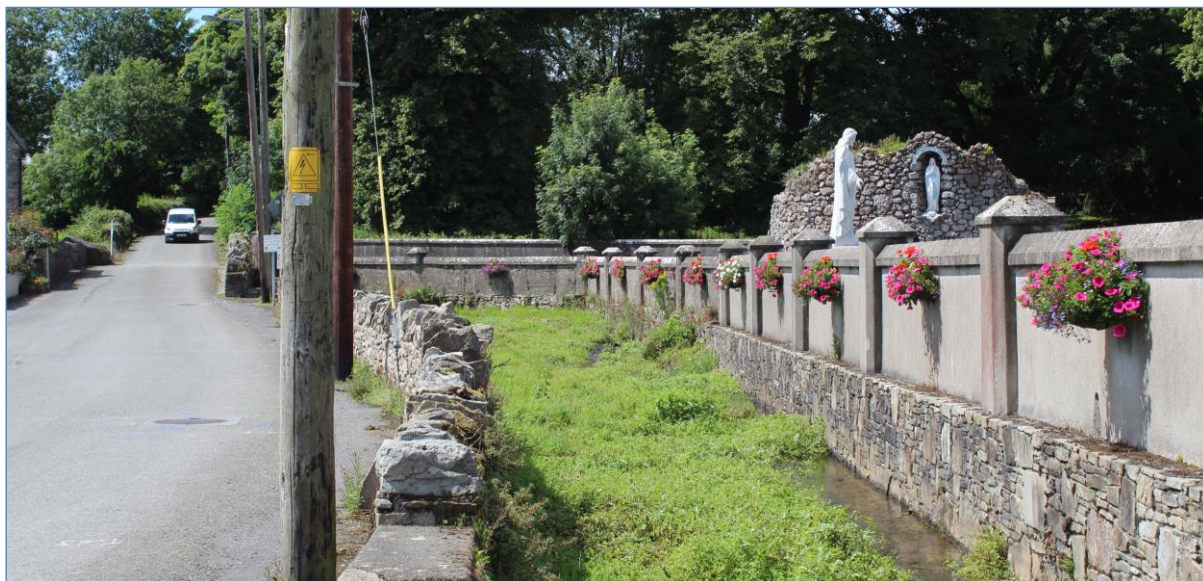


Plate 8-4: Stream channel south of church and graveyard

Arrigle Business Park and Main Street



Plate 8-5: Stream is culverted under Arrigle business park

The stream continues through the Arrigle Business Park, where it is culverted, and appears along the main street adjacent to the road, where it is very overgrown in some areas. Plate 8.5 shows the dense vegetation along the river in this section:



Plate 8-6: Overgrown stream along Main Street



Plate 8-7: Stream adjacent to Hazelbrook development *Plate 8-8: Ballyhale Bridge and adjacent trees*

The stream continues to flow adjacent to the Hazelbrook residential development, as shown in Plate 8-7, where it is more visible but still overgrown. It then runs under the main road at Ballyhale Bridge, where it meets the River Arrigle, and flows between an

area of open space, lined by mature trees, an area of SAC (which appeared recently cleared at time of site visit) to the north. This is shown in Plate 8-9 below.



Plate 8-9: River flows through SAC at northern end of the village

Landcover – vegetation and built form

The village has one main street, with several smaller streets leading off this. The town is described with reference to several areas which have their own character. West of the Main street, several areas have an individual character which include the church and vicinity, the Arrigle Business Park and Páirc na Seamróga. The Main Street has its own character, with an area at the northern entrance to the village also distinctive.

South of the village – church and surrounds

To the south of the village, there are several scattered dwellings to the east of the road, with large fields to the west, and a number of mature tree lines dividing these fields.



Plate 8-10: Mature tree lines at southern entrance to Ballyhale

The stream runs through these fields but is not visible.



Plate 8-11: Key view towards landmark church tower with mature trees

The church, mature trees and open fields combine to create a pleasant view on the southern approach to the town. The area around the church is characterised by mature trees, the church bell tower (which is also known as Ballyhale Castle) which forms a focal point, as shown above. Other details such as stone bridges, walls, the grotto, and the Ballyhale stream which crosses under the road south of the Church, and flows to the west of the church and graveyard as shown in Plate 8-10 and 8-11, combine to create a strong sense of historic character to this part of the village.



Plate 8-12: Stone walls, grotto, stream and mature trees south of church



Plate 8-13: View of Church, castle, graveyard, mature trees

To the west of the church, an open field with a number of mature trees (including Lime Trees) are found, adjacent to the stream. To the west of this lies Ballyhale Manor, a historic structure, also surrounded by mature trees.



Plate 8-14: Stone arched bridge



Plate 8-15: Mature trees west of church



Plate 8-16: Open field and hedgerow/tree line west of church and stream corridor

Beyond this, open fields lie along the stream corridor, with mature trees in the hedgerows as shown in Plate 8-13 above. The open fields then give way to built form at the Arrigle Business Park, seen in the background of Plate 8-15.



Plate 8-17: Buildings of Business Park and tree lines adjacent to open fields

Arrigle Business Park and Pairc na Seamróga

West of the main street, and north of the church and graveyard, landcover consists of a large area of warehouses and hard surface at the Arrigle business Park. This is an area which is different from the character of the church and vicinity, and also from the main street, with an industrial character and no important landscape or visual features. This is shown in Plate 8-5, where the low-quality buildings of recent construction, are seen juxtaposed with the historic Ballyhale Castle (church tower). To the west and north of the business park, the Ballyhale Shamrock's GAA pitch (Páirc na Seamróga) lies adjacent. There is a change in level visible, and several mature trees along the western boundary as evident in Plate 8-18 below.



Pairc na Seamróga consists of a large pitch (with a training pitch) surrounded by a walking track with several small buildings. The boundary contains some mature trees especially to the west and south, as shown below:



Plate 8-18: Mature tree line west of Ballyhale Shamrocks GAA pitch



Plate 8-19: Mature trees south of business park and Pairc na Seamroga

Arable fields bounded by mature hedgerows lie adjacent to the GAA pitch as shown below (along the proposed route of Options A-C).



Main Street and north of the village

The southern end of Main street has a dense urban form, with one and two storey houses forming the majority of the building types. There are some vernacular buildings with more recent infill buildings also.



Plate 8-20: Main Street in Ballyhale, southern end

On the northern end of Main street, the urban form becomes less dense, with some industrial buildings, the business park and GAA pitch entrance. On the eastern side of the street, a section of evergreen hedge and railing replaces built form to the east, while to the west of main street, the Ballyhale Stream is evident along the front of the an industrial building, the Pairc na Seamróg, and the Hazelbrook, development, as shown in Plates 8-20 and 21 below.



Plate 8-21: Northern end of Ballyhale main street- urban form becomes less dense



Plate 8-22: Stream corridor and industrial buildings on Main Street

The Ballyhale Bridge is located on the northern end of Main street, and beyond this, the stream runs between sheds and a residential open space and is bordered on the latter side by mature trees. North of the sheds, an area of open space (and SAC) is seen in Plate 8-23 below.



Plate 8-23: Stream runs adjacent open Space at northern end of village

To the west of Main street in this area, open arable fields and a mature tree line border the road which leads out of the village while to the east a small industrial estate is located.

Summary of Landscape and Visual Characteristics:

- The area in the vicinity of the Church and to the south has a strong historic character (shown in Figure with several key landscape and townscape features, which include mature trees, the historic church tower, stone walls, bridges and steps, and the stream which runs to the south and west, with a small secondary channel to the east of the graveyard.
- West of the Church are several very noticeable mature trees and a historic house (Ballyhale Manor). Mature trees lend an important character to this area,

and are visible from the road south of the church as well as the main road approaching the village from the south. These mature trees are also evident from the Arrigle Business Park and the GAA Pitch Pairc na Seamróg.

- Fields to the south and west of the church are characterized by mature tree lines and hedgerows, in particular the trees south of the church and west of Pairc na Seamróg. Some of these mature hedgerows provide a setting for the playing fields. There are several areas with mature trees along the stream at the northern boundary of the village.
- Main Street has a stronger vernacular character along the southern end, south of the Arrigle Business Park entrance, with dense urban form and a mixture of one and two storey buildings.
- The northern part of main street has a more open urban form with more industrial buildings and the GAA pitch entrance and some new housing developments – and overall a less distinctive character.
- It is also noted that while not a key landscape feature, Pairc na Seamróg has a strong cultural association as the home ground of the well-known Ballyhale Shamrocks hurling club.

The key landscape elements are indicated on Figure 8-4.



Figure 8-4: Key landscape features and views

Landscape Values

Conservation Values: These are elements which are considered to contribute to the character of the area and should be retained. These include elements which are considered valued in terms of landscape features, natural heritage, cultural heritage, visual amenity and recreation. These are as follows:

- The mature trees which are a conspicuous feature of several areas. There are also noted on the Urban Design Map in the LAP, and include the tree lines to the south of the Church (in the fields), as well as those in the vicinity of the church itself, especially those to the west along the stream corridor and surrounding the manor house to the west. Other mature tree lines are located to the west of the GAA pitch, and south of the GAA pitch//Business park.
- The stream is an attractive element, in certain locations, particularly in the vicinity of the church. It is also visible, but to a lesser extent, to the north of the village and along the main street.
- The stone wall, steps, and bridge visible to the south of the church are attractive and should be retained.
- The house to the west of the church (Ballyhale Manor) is listed on the NIAH, and surrounding lands are a feature of the landscape which contribute to the character of the area around the church.
- Pairc na Seamróg is not in itself considered a key landscape feature but it is a well-known cultural feature of the village, and is also used for formal as well as informal recreation (walking trail around periphery).
- Areas of ecological importance include the SAC to the north of the village and the area in the vicinity of the church

Enhancement Values: These represent opportunities for improvement

- The business park, and industrial building to the west of Main Street do not add to the landscape or townscape character
- There are sections of the stream – such as those which run along Main Street and east of the graveyard - which could be enhanced
- The land north of the Ballyhale Bridge, where the river runs between an open space and some sheds, could be enhanced (with appropriate ecological measures).

Views and Visual Amenity

There are several views in the village which have strong scenic characteristics. These include a view from the southern approach to the village, where the castle (church

tower) is visible among mature trees. The visual amenity in the vicinity of the church and area to the south and west, is considered high, and there is a key view from the main street towards the stream, bridge, church and trees. These are indicated on Figure 4 above.

While these are not key views, it should also be noted that There are also views from Ballyhale Shamrocks GAA pitch to the surrounding trees to the south and west, as well as to the hills which are pleasant.

2020

Bat Assessment – Ballyhale Flood Relief Scheme



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NPWS licence C13/2020 (Licence to handle bats, expires 31st December 2022)

NPWS licence 08/2020 (Licence to photograph/film bats, expires 31st December 2022)

NPWS licence DER/BAT 2019-138 on expiry (Survey licence, expires 29th March 2022).

Client: DBFL Consulting Engineers on behalf of Kilkenny County Council.

Project Name & Location: Ballyhale Flood Relief Scheme, Ballyhale, Co. Kilkenny

Report Revision History

Date of Issue	Draft Number	Issued To (process of issuing)
5 th November 2020	Draft 1	DBFL Consulting Engineers
9 th November 2020	Draft 2	DBFL Consulting Engineers
10 th December 2020	Final	DBFL Consulting Engineers

Purpose

This document has been prepared as a Report for Kilkenny Co. Co. Only the most up to-date report should be consulted. All previous drafts/reports are deemed redundant in relation to the named site.

Bat Eco Service accepts no responsibility or liability for any use that is made of this document other than by the client for the purposes for which it was originally commissioned and prepared.

Carbon Footprint Policy

It is the policy of Bat Eco Services to provide documentation digitally in order to reduce carbon footprint. Printing of reports etc. is avoided, where possible.

Bat Record Submission Policy

It is the policy of Bat Eco Services to submit all bat records to Bat Conservation Ireland database one year post-surveying. This is to ensure that a high level bat database is available for future desktop reviews. This action will be automatically undertaken unless otherwise requested, where there is genuine justification.

Executive Summary

Project Name & Location: Ballyhale Flood Relief Scheme, Ballyhale, Co. Kilkenny

Proposed work: Flood Relief Works

Bat Survey Results - Summary

Bat Species	Roosts	Foraging	Commuting
Common pipistrelle <i>Pipistrellus pipistrellus</i>		√	√
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	√	√	√
Nathusius' pipistrelle <i>Pipistrellus nathusii</i>			
Leisler's bat <i>Nyctalus leisleri</i>		√	√
Brown long-eared bat <i>Plecotus auritus</i>		√	√
Daubenton's bat <i>Myotis daubentonii</i>		√	√
Natterer's bat <i>Myotis nattereri</i>		√	√
Whiskered bat <i>Myotis mystacinus</i>			
Lesser horseshoe bat <i>Rhinolophus hipposideros</i>			

Bat Survey Duties Completed (Indicated by red shading)

Tree PBR Survey	<input checked="" type="checkbox"/>	Daytime Building Inspection	<input checked="" type="checkbox"/>
Static Detector Survey	<input checked="" type="checkbox"/>	Daytime Bridge Inspection	<input checked="" type="checkbox"/>
Dusk Bat Survey	<input checked="" type="checkbox"/>	Dawn Bat Survey	<input checked="" type="checkbox"/>
Walking Transect	<input checked="" type="checkbox"/>	Driving Transect	<input type="checkbox"/>
Trapping / Mist Netting	<input type="checkbox"/>	IR Camcorder filming	<input type="checkbox"/>
Endoscope Inspection	<input checked="" type="checkbox"/>	Other	<input type="checkbox"/>

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1. Introduction

Bat Eco Services was commissioned by DBFL Consulting Engineers to undertake a bat survey of proposed flood relief options for Ballyhale, Co. Kilkenny. The purpose of this bat survey is to determine the local bat populations and potential constraints which may influence the assessment and design of the project's route options and the final selection of a preferred flood relief route.

1.1 Relevant Legislation & Bat Species Status in Ireland

A small number of these animal and plant species are protected under Irish legislation (Nelson, *et al.*, 2019). The principal Irish legislation is the Wildlife Act 1976. Amendments to the Wildlife Act and its Statutory Instruments have enacted and amended protection of individual species, notably in order to comply with EU legislation or other international agreements. The Birds and Habitats Directives are the primary EU legislation resulting in the legal protection of species in Ireland. The Acts and Statutory Instruments which list species within the broad taxonomic groupings are referred to in the relevant sections.

1.1.1 Irish Legislation

The Wildlife Act 1976 (Number 39 of 1976) was amended on four occasions up to 2019, the principal being the Wildlife (Amendment) Act 2000 (Number 38 of 2000). The Flora (Protection) Order lists the plant species protected by Section 21 of the Wildlife Acts. The regulations that give rise to the protection of animal species under the Wildlife Acts are detailed in the relevant sections. See www.npws.ie/legislation for further information.

The codes used for national legislation are as follows:

- WA = Wildlife Act, 1976, Wildlife (Amendment) Act, 2000 and other relevant amendments
- FPO = Flora (Protection) Order, 2015 (S.I. No. 356 of 2015)

1.1.2 EU Legislation

The primary legislation transposing the Nature Directives (Birds and Habitats Directives) into Irish law is the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011), as amended.

The codes used for the EU Nature Directives and Habitats Directives (Council Directive 92/43/EEC) are:

- Annex II Animal and plant species listed in Annex II
- Annex IV Animal and plant species listed in Annex IV
- Annex V Animal and plant species listed in Annex V

The main aim of the Habitats Directive is the conservation of biodiversity by requiring Member States to take measures to maintain or restore natural habitats and wild species listed on the Annexes to the Directive at a favourable conservation status. These annexes list habitats (Annex I) and species (Annexes II, IV and V) which are considered threatened in the EU territory. The listed habitats and species represent a considerable proportion of biodiversity in Ireland and the Directive itself is one of the most important pieces of legislation governing the conservation of biodiversity in Europe.

Under Article 11 of the Directive, each member state is obliged to undertake surveillance of the conservation status of the natural habitats and species in the Annexes and under Article 17, to report to the European Commission every six years on their status and on the implementation of the measures taken under the Directive. In April 2019, Ireland submitted the third assessment of

conservation status for 59 habitats and 60 species. There are three volumes with the third listing details of the species assessed.

1.1.3 IUCN Red Lists

The International Union for the Conservation of Nature (IUCN) coordinates the Red Listing process at the global level, defining the categories so that they are standardised across all taxa. Red Lists are also produced at regional, national and subnational levels using the same IUCN categories (IUCN 2012, 2019). Since 2009, Red Lists have been produced for the island of Ireland by the National Parks and Wildlife Service (NPWS) and the Northern Ireland Environment Agency (NIEA) using these IUCN categories. To date, 13 Red Lists have been completed. The Red Lists are an assessment of the risk of extinction of each species and not just an assessment of their rarity. Threatened species are those species categorised as Critically Endangered, Endangered or Vulnerable (IUCN, 2019) – also commonly referred to as ‘Red Listed’.

1.1.4 Irish Red List - Mammals

Red Lists in Ireland refer to the whole island, i.e. including Northern Ireland, and so follow the guidelines for regional assessments (IUCN, 2012, 2019). The abbreviations used are as follows:.

- RE Regionally Extinct
- CR Critically Endangered
- EN Endangered
- VU Vulnerable
- NT Near Threatened
- DD Data Deficient
- LC Least Concern
- NA Not Assessed
- NE Not Evaluated

There are 27 terrestrial mammal species in Ireland, which includes the nine resident bat species listed. The terrestrial mammal, according to Marnell *et al.*, 2019, list for Ireland consists of all terrestrial species native to Ireland or naturalised in Ireland before 1500. The IUCN Red List categories and criteria are used to assess that status of wildlife. This was recently completed for the terrestrial mammals of Ireland. Apart from the two following two mammal species (grey wolf *Canis lupus* (regionally extinct) and black rat *Rattus rattus* (Vulnerable)), the remaining 25 species were assessed as least concern in the most recent IUCN Red List publication by NPWS (Marnell *et al.*, 2019).

1.1.5 Irish Bat Species

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife Amendment Acts (2000 and 2010). Also, the EC Directive on The Conservation of Natural habitats and of Wild Fauna and Flora (Habitats Directive 1992), seeks to protect rare species, including bats, and their habitats and requires that appropriate monitoring of populations be undertaken. All Irish bats are listed in Annex IV of the Habitats Directive and the lesser horseshoe bat *Rhinolophus hipposideros* is further listed under Annex II. Across Europe, they are further protected under the Convention on the Conservation of European Wildlife and Natural Habitats (Bern Convention 1982), which, in relation to bats, exists to conserve all species and their habitats. The Convention on the Conservation of Migratory Species of Wild Animals (Bonn Convention 1979, enacted 1983) was instigated to protect migrant species across all European boundaries. The Irish government has ratified both these conventions.

Also, under existing legislation, the destruction, alteration or evacuation of a known bat roost is a notifiable action and a derogation licence has to be obtained from the *National Parks and Wildlife Service* before works can commence. Any works interfering with bats and especially their roosts, may only be carried out under a licence to derogate from Regulation 23 of the Habitats Regulations 1997 and Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011 (which transposed the EU Habitats Directive into Irish law). The details with regards to appropriate assessments, the strict parameters within which derogation licences may be issued and the procedures by which and the order in relation to the planning and development regulations such licences should be obtained, are set out in Circular Letter NPWS 2/07 "*Guidance on Compliance with Regulation 23 of the Habitats Regulations 1997 - strict protection of certain species/applications for derogation licences*" issued on behalf of the Minister of the Environment, Heritage and Local Government on the 16th of May 2007.

There are eleven recorded bat species in Ireland, nine of which are considered resident. Eight resident bat species and one of the vagrant bat species are vesper bats and all vespertilionid bats have a tragus (cartilaginous structure inside the pinna of the ear). Vesper bats are distributed throughout the island. Nathusius' pipistrelle *Pipistrellus nathusii* is a recent addition while the Brandt's bat has only been recorded once to-date (Only record confirmed by DNA testing, all other records has not been genetically confirmed). The ninth resident species is the lesser horseshoe bat *Rhinolophus hipposideros*, which belongs to the Rhinolophidea and has a complex nose leaf structure on the face, distinguishing it from the vesper bats. This species' current distribution is confined to the western seaboard counties of Mayo, Galway, Clare, Limerick, Kerry and Cork. The eleventh bat species, the greater horseshoe bat, was only recorded for the first time in February 2013 in County Wexford and is therefore considered to be a vagrant species.

A total of 41 SACs have been designated for the Annex II species lesser horseshoe bat (1303), of which nine have also been selected for the Annex I habitat 'Caves not open to the public' (8310).

Irish bat species list (please see main body of text for more information in individual bat species) is presented in Table 1. The current status of the known bat species occurring in Ireland is given in the Table 1 below.

Table 1: Status of the Irish bat fauna (Marnell *et al.*, 2019).

Species: Common Name	Irish Status	European Status	Global Status
Resident Bat Species ^			
Daubenton's bat <i>Myotis daubentonii</i>	Least Concern	Least Concern	Least Concern
Whiskered bat <i>Myotis mystacinus</i>	Least Concern	Least Concern	Least Concern
Natterer's bat <i>Myotis nattereri</i>	Least Concern	Least Concern	Least Concern
Leisler's bat <i>Nyctalus leisleri</i>	Least Concern	Least Concern	Least Concern
Nathusius' pipistrelle <i>Pipistrellus nathusii</i>	Least Concern	Least Concern	Least Concern
Common pipistrelle <i>Pipistrellus pipistrellus</i>	Least Concern	Least Concern	Least Concern
Soprano pipistrelle <i>Pipistrellus pygmaeus</i>	Least Concern	Least Concern	Least Concern
Brown long-eared bat <i>Plecotus auritus</i>	Least Concern	Least Concern	Least Concern
Lesser horseshoe bat <i>Rhinolophus hipposideros</i>	Least Concern	Least Concern	Least Concern
Possible Vagrants ^			
Brandt's bat <i>Myotis brandtii</i>	Data deficient	Least Concern	Least Concern
Greater horseshoe bat <i>Rhinolophus ferrumequinum</i>	Data deficient	Near threatened	Near threatened

^ Roche *et al.*, 2014

1.2 Relevant Guidance Documents

This report will draw on guidelines already available in Europe and will use the following documents:

- National Roads Authority (2006) Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes
- Collins, J. (Editor) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edition). Bat Conservation Trust, London
- McAney, K. (2006) A conservation plan for Irish vesper bats, Irish Wildlife Manual No. 20 National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Kelleher, C. & Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- The status of EU protected habitats and species in Ireland: Conservation status in Ireland of habitats and species listed in the European Council Directive on the Conservation of Habitats, Flora and Fauna 92/43/EEC. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government.

Based on the information collected during the desktop studies and bat surveys, the bat ecologist assigns, where possible, an ecological value to each bat species recorded based on its conservation status at different geographical scales (Table 2). For example, a site may be of national ecological value for a given species if it supports a significant proportion (e.g. 5%) of the total national population of that species.

Table 2: The six-level ecological valuation scheme used in the CIEM Guidelines (2016) Ecological Value

Ecological Value	Geographical Scale of Importance
International	International or European scale
National	The Republic of Ireland or the island of Ireland scale (depending on the bat species)
Regional	Province scale: Leinster
County	County scale: Kilkenny
Local	Proposed development and immediate surroundings
Negligible	None, the feature is common and widespread

Impacts on bats can arise from activities that may result in:

- Physical disturbance of bat roosts e.g. destruction or renovation of buildings
- Noise disturbance e.g. increase human presence, use of machinery etc.
- Lighting disturbance
- Loss of roosts e.g. destruction or renovation of buildings
- Modifications of commuting or foraging habitats
- Severance or fragmentation of commuting routes
- Loss of foraging habitats.

It is recognised that any development will have an impact on the receiving environment, but the significance of the impact will depend on the value of the ecological features that would be affected. Such ecological features will be those that are considered to be important and potentially affected by the proposed development.

The guidelines consulted recommend that the potential impacts of a proposed development on bats are assessed as early as possible in the design stage to determine any areas of conflicts.

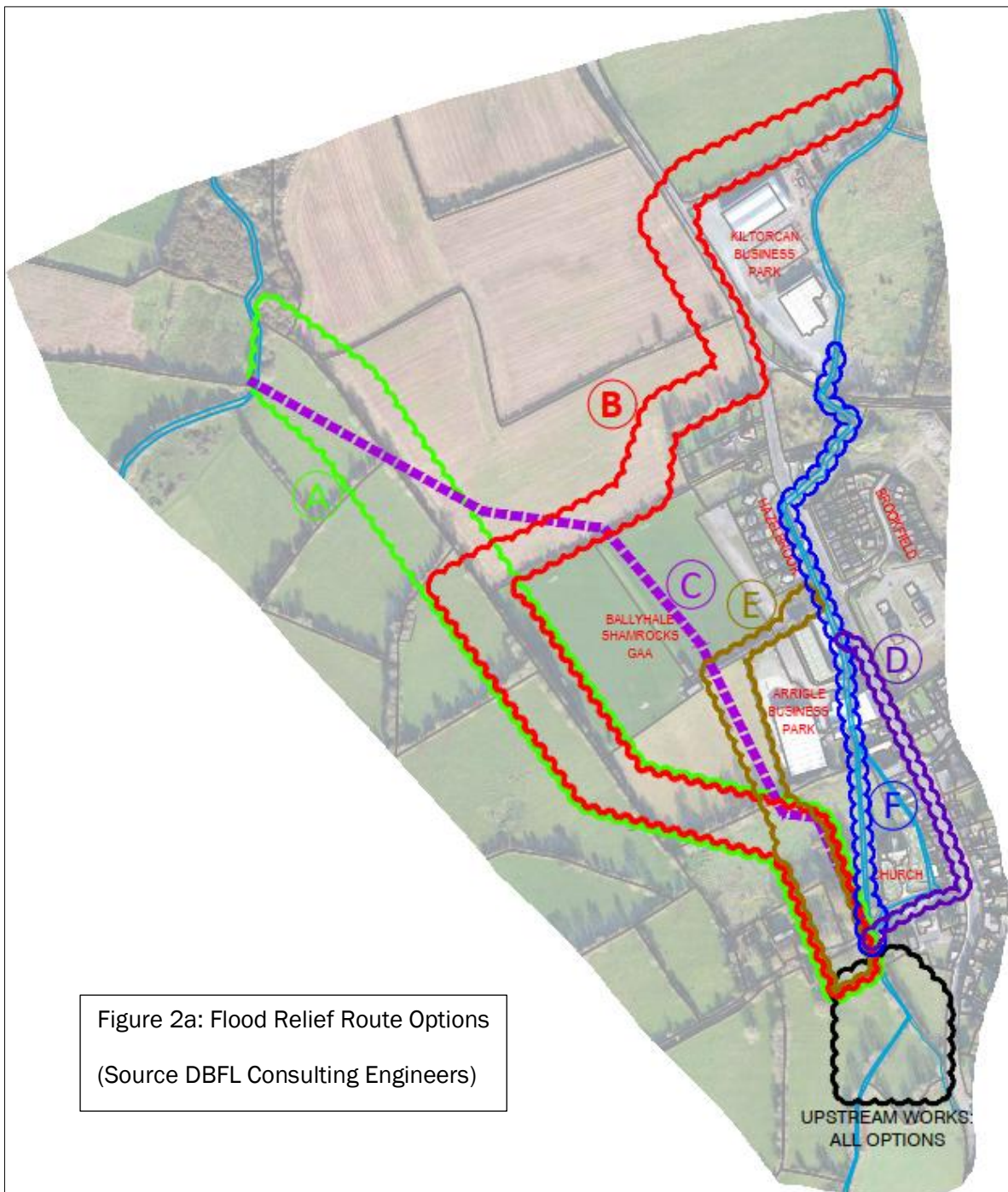


Figure 2a: Flood Relief Route Options
(Source DBFL Consulting Engineers)

KEY (INDICATIVE ROUTE CORRIDOR)	OPTION	UPSTREAM WORKS	CONVEYANCE WORKS	NOTES
	A	FLOW DIVERSION STRUCTURE AND HARD DEFENSES	OPEN CHANNEL OVERFLOW ROUTE TO LITTLE ARRIGLE RIVER	
	B	FLOW DIVERSION STRUCTURE AND HARD DEFENSES	OPEN CHANNEL OVERFLOW ROUTE TO BALLYHALE RIVER	
	C	FLOW DIVERSION STRUCTURE AND HARD DEFENSES	OPEN CHANNEL OVERFLOW ROUTE TO LITTLE ARRIGLE RIVER	ROUTE PER OPW CFAM
	D	FLOW DIVERSION STRUCTURE AND HARD DEFENSES	UNDERGROUND PIPED OVERFLOW ROUTE ALONG EXISTING ROADS TO BALLYHALE RIVER	
	E	FLOW DIVERSION STRUCTURE AND HARD DEFENSES	PARTIALLY OPEN, PARTIALLY PIPED OVERFLOW ROUTE TO BALLYHALE RIVER	
	F	FLOW DIVERSION STRUCTURE AND HARD DEFENSES	UPGRADE WORKS TO EXISTING CHANNEL/STRUCTURES WHERE NEEDED	

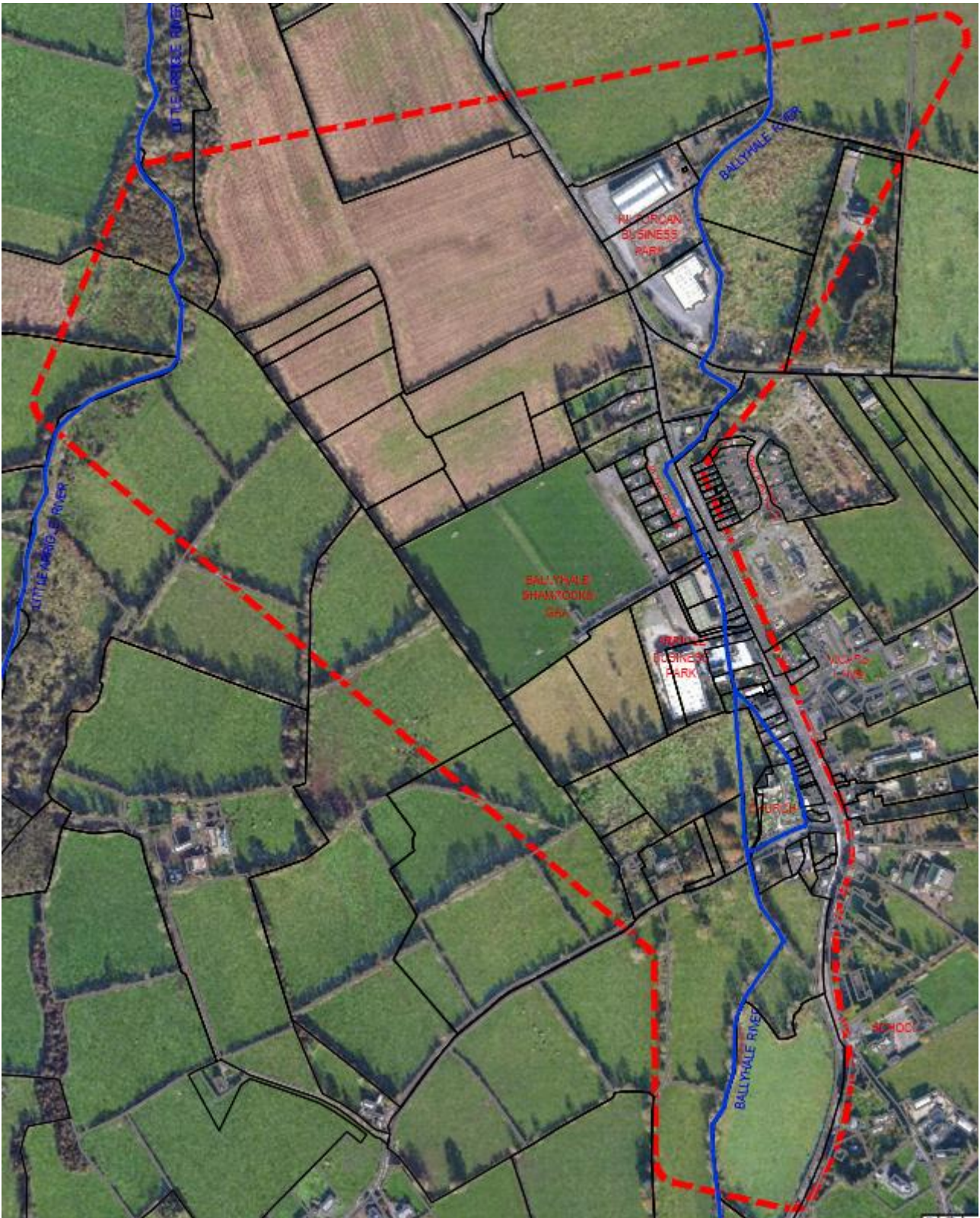


Figure 2b: Proposed bat survey area (Source DBFL Consulting Engineers)

1.3.3 Bat Survey Aims

The aims of the bat survey at the proposed project site are as follows:

- Collect robust data following good practice guidelines to allow an assessment of the potential impacts of the proposed project on local bat populations, both on and off-site (where possible);
- Facilitate the design of mitigation, enhancement and monitoring strategies for local bat populations recorded;
- Provide baseline information with which the results of post-construction monitoring surveys can be compared to, where appropriate;
- Provide information to enable NPWS and planning authorities to reach robust decisions with definitive required outcomes;
- Assist clients in meeting their statutory obligations;
- Facilitate the conservation of local bat populations.

Survey are comprised of many different types may differ from site to site depending on the goals of the survey. The following is a brief description of main types of surveys that can be completed. The surveys deemed suitable for a particular project is determine on a case-by-case basis.

- Emergence (dusk) surveys: surveying of buildings or structures to determine whether such building/structure is a bat roost. Undertaken from 10 minutes prior to sunset to 90 minutes after sunset.
- Walking transect: bat surveys completed on-foot where the surveyor(s) walk the survey site from 10 minutes prior to sunset to at least 110 minutes after sunset. Often this survey is completed post an emergence survey and therefore may be undertaken for a longer period of time after sunset.
- Driving transect: bat survey complete in a car and undertaken according to a strict survey protocol. Surveying is completed from 40 minutes after sunset till the end of the planned survey route. This is only undertaken for large survey area with a well-defined public road structure. Routes are planned and mapped prior to surveying.
- Dawn surveys: surveying of buildings or structures to determine whether such building/structure is a bat roost. Undertaken from 90 minutes prior to sunrise to 10 minutes after sunrise.
- Static surveys: placement of automated recording devices within the survey area. The units are set up during the daylight hours and left in place to record during the hours of darkness.
- Additional surveys required may include trapping / netting of bats. But this type of surveying is only undertaken where specific information is required (e.g. to determine if a roost is a maternity colony).

2. Bat Survey Methodology

2.1 Daytime Inspections

One purpose of daytime inspections is to determine the potential of bat roosts within the survey area. Due to the transient nature of bats and their seasonal life cycle, there are a number of different type of bat roosts. Where possible, one of the objectives of the surveys is to be able to identify the types of roosts present, if any. However, the determination of the type of roost present depends on the timing of the survey and the number of bat surveys completed. Consequently, the definition of roost types, in this report, will be based on the following:

Table 3: Bat Roost Types (Collins 2016).

Roost Type	Definition	Time of Survey
Day Roost	A place where individual bats or small groups of males, rest or shelter in the daytime but are rarely found by night in the summer.	Anytime of the year
Night Roost	A place where bats rest or shelter in the night but are rarely found in the day. May be used by a single bat on occasion or it could be used regularly by the whole colony.	Anytime of the year
Feeding Roost	A place where individual bats or a few bats rest or feed during the night but are rarely present by day.	Anytime of the year
Transitional Roost	A place used by a few individuals or occasionally small groups for generally short periods of time on waking from hibernation or in the period prior to hibernation.	Outside the main maternity and hibernation periods.
Swarming Site	Where large numbers of males and females gather. Appear to be important mating sites.	Late summer and autumn
Mating Site	Where mating takes place.	Late summer and autumn
Maternity Site	Where female bats give birth and raise their young to independence.	Summer months
Hibernation Site	Where bats are found, either individually or in groups in the winter months. They have a constant cool temperature and humidity.	Winter months in cold weather conditions
Satellite Roost	An alternative roost found in close proximity to the main nursery colony and is used by a few individuals throughout the breeding season.	Summer months

2.1.1 Building & Structure Inspection

Structures, buildings and other likely places that may provide a roosting space for bats are inspected during the daytime for evidence of bat usage. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present on stonework) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice, for example, has occurred in the past. Inspections are undertaken visually

with the aid of a strong torch beam (LED Lenser P14.2) and endoscope (General DC5660A Wet / Dry Scope).

Bridge structures and similar stone structures are assessed using a 4-point classification system designed for bridges by Billington & Norman (1997) as follows:

Table 4: Bridge and Stone Structure Bat Roost Classification System (Adapted from Billington & Norman, 1997).

Bridge Category	Description
0	No potential (i.e. no suitable crevices for roosting bats).
1	Low potential (i.e. crevices present that may be of use to bats).
2	High potential (i.e. crevices ideal for roosting bats but no evidence of usage during inspections).
3	Roost (evidence of bats roosting either because bats are present or other evidence is recorded during inspection (e.g. bat droppings)).

2.1.2 Tree Potential Bat Roost (PBRs) Inspection

Trees that may provide a roosting space for bats are classified using the Bat Tree Habitat Key (BTHK, 2018) and the classification system used is from Collins (2016). The Potential Roost Features (PRFs) listed in this guide are used to determine the PBR value of trees.

Trees identified as PBRs are inspected during the daytime, where possible, for evidence of bat usage. Evidence of bat usage is in the form of actual bats (visible or audible), bat droppings, urine staining, grease marks (oily secretions from glands present on stonework) and claw marks. In addition, the presence of bat fly pupae (bat parasite) also indicated that bat usage of a crevice, for example, has occurred in the past.

A series of inspections are undertaken. Phase 1 inspections aims to make a list of trees within the proposed development site that may be suitable as roosting sites for bats. Inspections are undertaken visually with the aid of a strong torch beam (LED Lenser P14.2) during the daytime searching for PRFs, if visible. To aid this Phase 1 inspection, tree reports, if available, are consulted to supplement that data collected.

Phase 2 inspections are, generally, recommended once a complete list of trees that have been identified as PBRs, and are mark for felling in order for the proposed development to be undertaken. The Phase 2 inspection will generally involve a closer examination of individual trees using a strong torch beam (LED Lenser P14.2) and endoscope (General DC5660A Wet / Dry Scope) and where required (and/or possible), height surveys are completed using a ladder. If a tree is deemed to be a roost site then further surveying involving dusk and dawn surveys of the actual trees may be recommended to determine what bat species are present etc.

Table 5: Tree Bat Roost Category Classification System (Collins, 2016).

Tree Category	Description
1 High	Trees with multiple, highly suitable features (Potential Roosting Features = PRFs) capable of supporting larger roosts
2 Moderate	Trees with definite bat potential but supporting features (PRFs) suitable for use by individual bats;
3 Low	Trees have no obvious potential although the tree is of a size and age that elevated surveys may result in cracks or crevices being found or the tree supports some features (PRFs) which may have limited potential to support bats;
4	Trees have no potential.

2.1.3 Bat Habitat & Commuting Routes Mapping

The survey site is assessed during daytime walkabout surveys, in relation to potential bat foraging habitat and potential bat commuting routes. Such habitats are classified according to Fossit, 2000 (Appendix 1, Table 1.B) while hedgerows are classified according to BATLAS 2020 classification (Bat Conservation Ireland, 2015) (Appendix 1, Table 1.A). Bat habitats and commuting routes identified are considered in relation to the wider landscape to determine landscape connectivity for local bat populations through the examination of aerial photographs.

2.2 Night-time Bat Detector Surveys

2.2.1 Dusk & Dawn Bat Surveys

Dusk surveys were started from 10 minutes before sunset to at least 100 minutes post sunset (extended survey period times occurred in relation to walking transects). During Dusk Emergence Surveys, the surveyors positioned themselves adjacent to the building / structure to be surveyed to determine if bats are roosting within, location of roost, number of bats, bat species etc. In relation to Ballyhale Bat Surveys, surveying was completed for 100 minutes for Dusk Emergence Surveys followed by an additional 100 minute walking transect.

Dawn surveys were completed from 90 minutes before sunrise to 10 minutes after sunrise. Surveys were completed during mild and dry weather conditions with air temperature 8°C or greater. All bat encounters are noted during surveys.

The following equipment is generally used:

Surveyor 1 (Principal surveyor): Anabat Walkabout Full Spectrum Bat Detector and Petersson D200 Heterodyne Bat Detector.

Surveyor 2: Wildlife Acoustics Echo Meter Touch2 Pro (Android) connected to Samsung Galaxy Tab S3 and Petersson D200 Heterodyne Bat Detector.

Walking transects involve the surveyor(s) walking the survey area, noting the time, location and bat species encountered. If the mapping facility is used on the Wildlife Acoustics Echo Meter Touch2 Pro (Android) connected to Samsung Galaxy Tab S3, this is mapped using Google Earth with a KLM file produced for mapping purposes. Validation of bat records is completed by the principal bat

surveyor prior to mapping. Otherwise, Irish Grid references are recorded and an excel file of bat record locations is produced for mapping.

2.2.2 *Passive Static Bat Detector Survey*

A Passive Static Bat Surveys involves leaving a static bat detector unit (with ultrasonic microphone) in a specific location and set to record for a specified period of time (i.e. a bat detector is left in the field, there is no observer present and bats which pass near enough to the monitoring unit are recorded and their calls are stored for analysis post surveying). The bat detector is effectively used as a bat activity data logger. This results in a far greater sampling effort over a shorter period of time. Bat detectors with ultrasonic microphones are used as the ultrasonic calls produced by bats cannot be heard by human hearing.

The microphone of the unit is position horizontally to reduce potential damage from rain. Bat Logger A+ units and Wildlife Acoustics Song Meter SM2, SM2 BAT+ SM4 Bat FS and SM3 BAT Platform Units use Real Time recording as a technique to record bat echolocation calls and using specific software, the recorded calls are identified. It is these sonograms (2-d sound pictures) that are digitally stored on the SD card (or micro SD cards depending on the model) and downloaded for analysis. These results are depicted on a graph showing the number of bat passes per species per hour/night. Each bat pass does not correlate to an individual bat but is representative of bat activity levels. Some species such as the pipistrelles will continuously fly around a habitat and therefore it is likely that a series of bat passes within a similar time frame is one individual bat. On the other hand, Leisler’s bats tend to travel through an area quickly and therefore an individual sequence or bat pass is more likely to be indicative of individual bats

The recordings are analysed using various software. Recordings made by SongMeter SM2Bat+ (Unit 5), Song Meter Bat FS (Units 3-5) were analysed using Wildlife Acoustics Kaleidoscope Pro. Each sequence of bat pulses are noted as a bat pass to indicate level of bat activity for each species recorded. This is either expressed as the number of bat passes per hour or per survey night.

The following static units were deployed during this static bat detector survey:

Table 6: Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Unit Code	Bat Detector Type	Recording Function	Microphone
SM2 Unit 5	Wildlife Acoustics SongMeter 2 Bat+	Passive Full Spectrum	SMX-U1 (connected directly to unit)
SM4 Unit 3 SM4 Unit 4 SM4 Unit 5	Wildlife Acoustics SongMeter 4 Bat FS	Passive Full Spectrum	SMM-U2, 4m cable

2.3 Desktop Review

2.3.1 *Bat Conservation Ireland Database*

A data search for a 10km radius of Ballyhale, Co. Kilkenny was requested from Bat Conservation Ireland.

2.4 Photographic Record

A photographic record is completed for the survey and is presented in Section 9.

2.5 Survey Constraints

The following assessment has been completed in relation to Survey Constraints:

Table 7: Survey Constraint Assessment Results.

Category	Discussion
Timing of surveys	September – during bat activity season.
Weather conditions	Poor on the 11 th September but ideal on 12 th , 13 th & 14 th September 2020
Survey effort Static Surveillance: 90 hrs Dusk & Dawn Surveys – 9 hrs Daytime Inspections – 5 hrs TOTAL: 104 hrs	Static Surveillance – 4 units, 3 nights Dusk Surveys – 13/9/2020 (2 surveyors), 14/9/2020 (2 surveyors) – included walking transects on both nights. Dawn Survey – 14/9/2020 (2 surveyors) Daytime Surveys – Bridge inspections, Tree inspections
Equipment	SM4 Unit 5 failed to record. All other equipment in good working order.

It is therefore deemed that the survey work completed is Appropriate in order to completed the aims of the bat survey.

3. Bat Survey Results

3.1 Daytime Inspections

3.1.1 Building & Structure Inspection

All of the bridges and culverts within the village of Ballyhale were inspected on the 14/9/2020. No bats were recorded roosting in any of the structures. None of the structures were deemed suitable for roosting bats.

Table 8: Bridge & Culvert inspection results.

Bridge Code	Description	Roost Type / Suitability	Bat Species
1	Double culvert (adjacent to logistics building)	Only 1m above water. No crevices. NOT SUITABLE FOR BATS Bridge Category 0	None
2	Bridge adjacent to housing estate (Hazel Brook)	Only 1m above water. No crevices. NOT SUITABLE FOR BATS	None
3	Bridge / Culvert running under the Main Street between Hazel Brook and Tyre Centre	Double arch, pointed running from 1m to 1.5m height. NOT SUITABLE FOR BATS Bridge Category 0	None Please note: otter spraints, freshwater crayfish and Dipper recorded.
4	Bridge at access into GAA grounds	No crevices. NOT SUITABLE FOR BATS Bridge Category 0	None
5	Bridge at access into Bouncy Castle Centre	No crevices. NOT SUITABLE FOR BATS Bridge Category 0	None
6	Bridge at access into Arrigle Business Park	Double culvert. No crevices. NOT SUITABLE FOR BATS Bridge Category 0	None
7	Small pedestrian bridges to rear of residences	No crevices. NOT SUITABLE FOR BATS Bridge Category 0	None
8	Church grounds	Double culverts, 1m or less in height. No crevices. NOT SUITABLE FOR BATS Bridge Category 0	None
9	Bridge under local road to rear of church	Double arch. No crevices. NOT SUITABLE FOR BATS Bridge Category 0	None
10	Single arch concrete bridge in field to rear of church.	No crevices. NOT SUITABLE FOR BATS Bridge Category 0	None

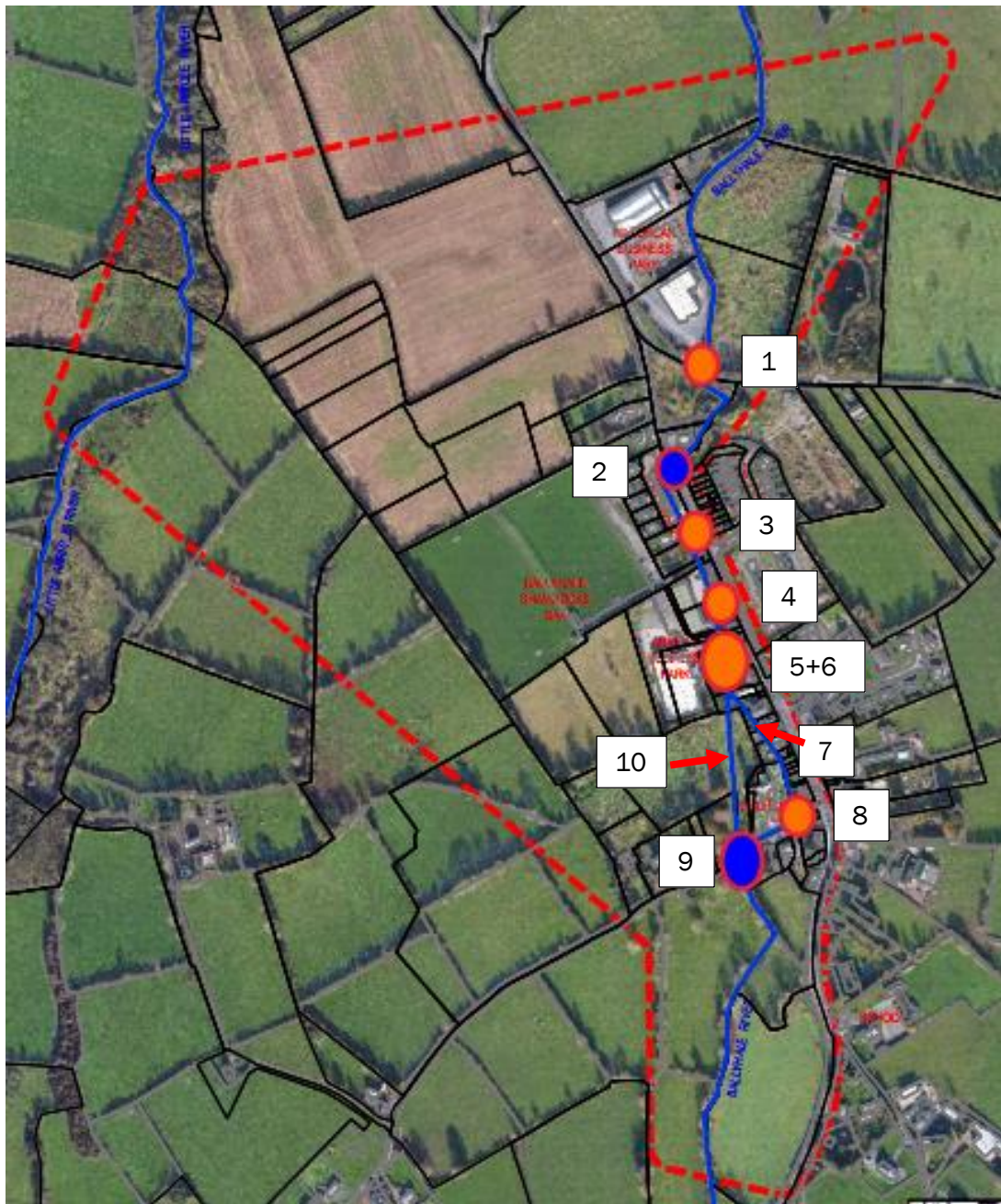


Figure 3a: Location of bridges and culverts surveyed, Ballyhale, Co. Kilkenny (Source DBFL Consulting Engineers).



Plate 1: Bridge 10, Ballyhale, Co. Kilkenny.



Plate 2: Bridge 8, Ballyhale, Co. Kilkenny.

3.1.2 Tree Potential Bat Roost (PBRs) Inspection

Mature trees within the survey area were inspected to determine their Potential Bat Roost (PBR) for bats. This was completed on 13/9/2020 and the following trees listed in Table 9 (Figure 3b) were deemed to have a PBR. All of the trees listed below have a Category 1 PBR rating because they have suitable features that can provide roosting sites for bats.

Table 9: Tree PBR inspection results.

Tree No.	Tree Species	Location	PRFs	Bat Usage	Value
Trees 1-5 Plate 3	Lime(x3) Sycamore (x2)	5 mature trees located in the field to the rear of the church.	Large number of tree holes, dead wood, spilt limbs	Five species of bat recorded foraging in vicinity of this treeline.	High Value for bats. Category 1 in relation to potential roosting.
Trees 6-7	Ash (x2)	2 mature ash trees located in field across from primary school	Large number of tree holes, dead wood, spilt limbs	Five species of bat recorded foraging in vicinity of this treeline. Particularly high level of Natterer's bat activity.	High Value for bats. Category 1 in relation to potential roosting.
Tree 8-10 Plate 4	Ash (x3)	Boundary of GAA grounds	Large number of tree holes, dead wood, spilt limbs	Four species of bat recorded foraging in vicinity of this treeline. Particularly high level of Natterer's bat activity.	High Value for bats. Category 1 in relation to potential roosting.

3.1.3 Bat Habitat & Commuting Routes Mapping

The surrounding landscape of Ballyhale, Co. Kilkenny is agricultural land with treelines and hedgerows. There is a high level of connectivity in the landscape which makes it suitable for commuting and foraging bat populations. A habitat map commissioned by Kilkenny County Council Heritage Office is presented below (Figure 3c).

The village of Ballyhale has extensive street lights which reduces it's suitability for foraging and commuting bats considered to be light sensitive (e.g. Daubenton's bats).

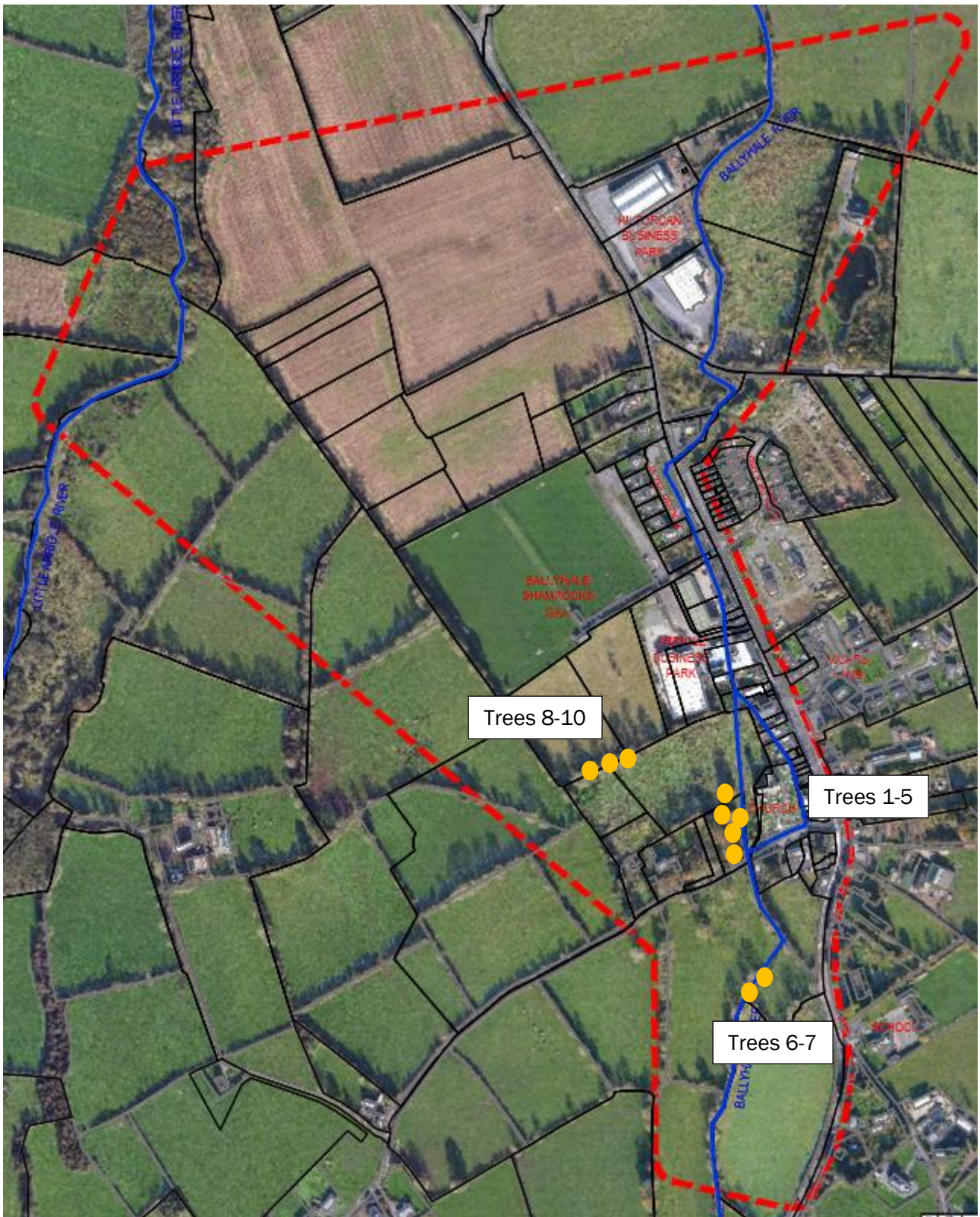


Figure 3b: Approximate location of trees deemed to have a PBR value – orange circles (Source DBFL Consulting Engineers). Please refer to Table 9 for more details.

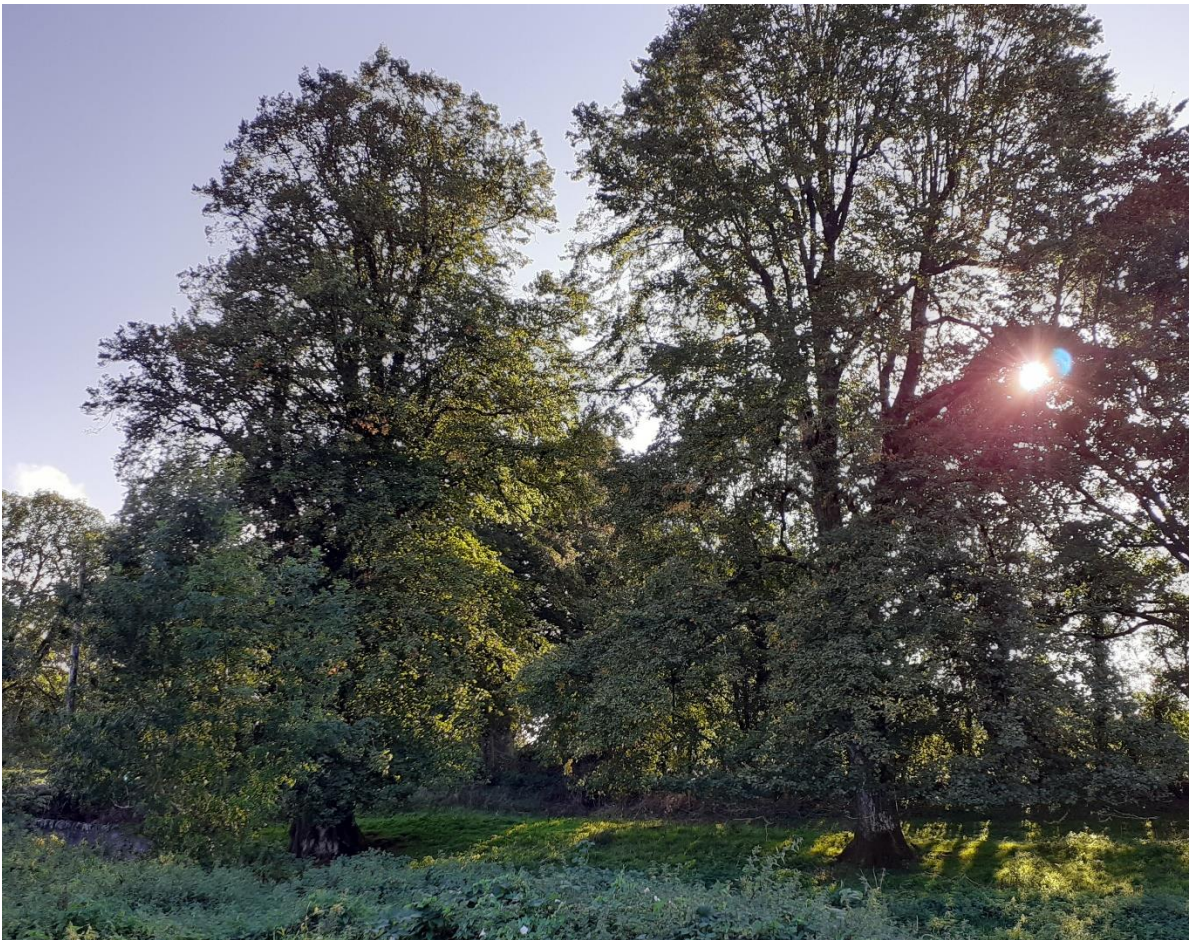


Plate 3: Mature trees west of church, Ballyhale, Co. Kilkenny.



Plate 4: Mature treelines along the boundary of GAA pitch, Ballyhale, Co. Kilkenny.

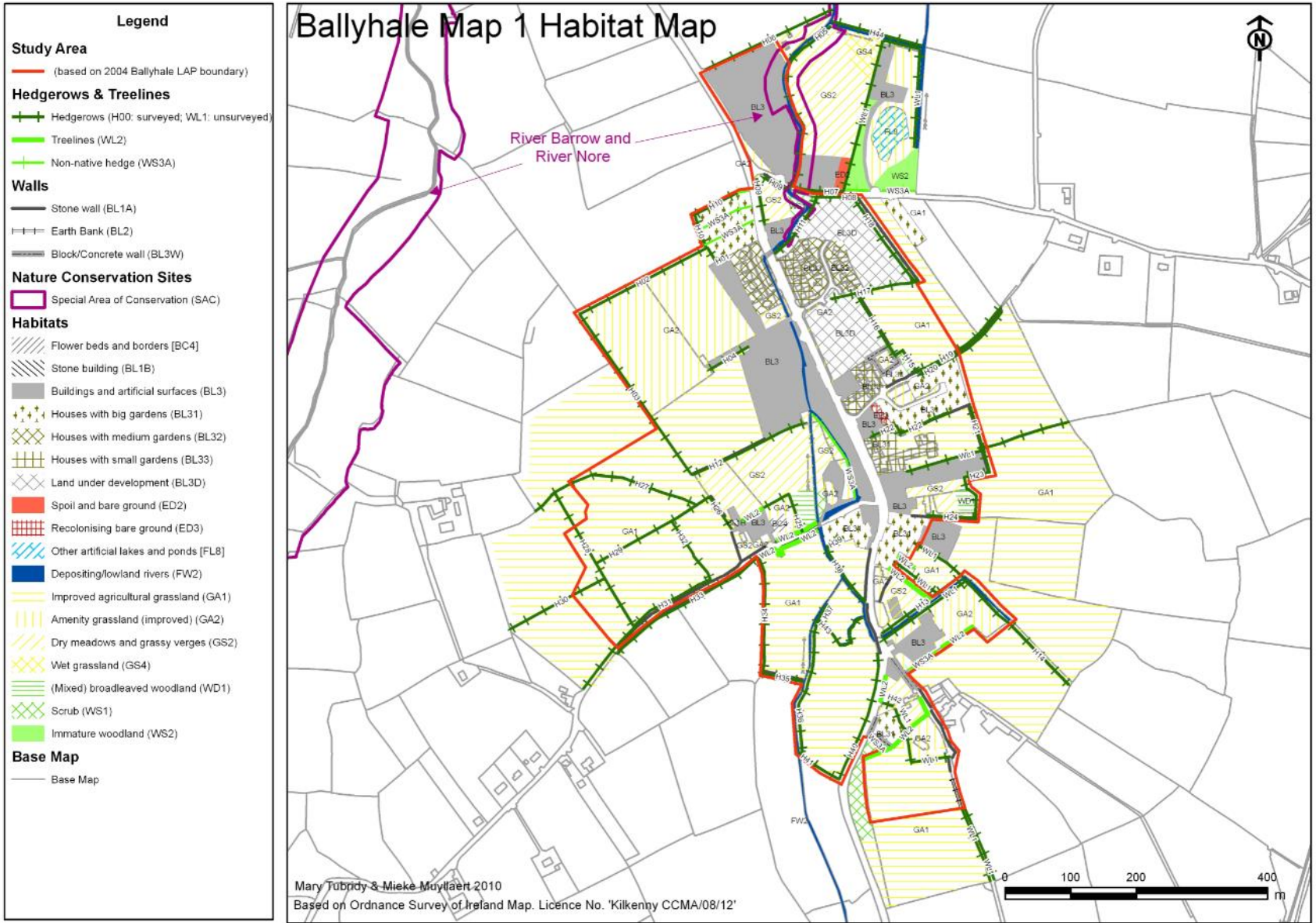


Figure 3c: Habitat Map for Ballyhale, Co. Kilkenny (Source: Heritage Office, Kilkenny Co. Co.)

3.2 Night-time Bat Detector Surveys

3.2.1 Dusk & Dawn Bat Survey

The following figure (Figure 4a) and Table 10 summarises the results of the bat detector surveys completed in relation to buildings located within the survey area.

The shed within the Business Park was surveyed by Surveyor 1 during the Dusk Survey on 13/9/2020. There was no access to the business park and therefore, the survey was conducted from the adjacent field. No bats were recorded emerging from the building but common pipistrelles and soprano pipistrelles were recorded commuting through the business park to the fields located to the rear of the business park.

During the Dawn Survey on 14/9/2020, it was noted that bats were swarming around a private residence located adjacent to the church. Therefore a Dusk Survey was completed in relation to this private residence and the church on eve of the 14/9/2020. A satellite roost for soprano pipistrelles was confirmed roosting in the private residence. No bats were recorded emerging from the church.

Table 10: Buildings / Structures survey results.

Building Code	Roost Type & Location	Bat Species (No. of bats)	Access Points	Vegetation / Lighting arrangement
Church (1) Plate 5	None	None	Not applicable	Yes - present
Private residence (2)	Roof space	Soprano pipistrelle (satellite roost)	Facia board/soffit	Yes - present
Shed (Business Park) (3) Plate 6	None	None	Not applicable	Yes - present



Figure 4a: Roost Surveys.



Plate 5: Church and tower, Ballyhale, Co. Kilkenny.



Plate 6: Shed, Ballyhale, Co. Kilkenny.

A total of six species of bat was recorded commuting and foraging within the survey area (common pipistrelles, soprano pipistrelles, Leisler's bats, Daubenton's bat, Natterer's bats and brown long-eared bats). Common pipistrelle and soprano pipistrelles was the most frequently recorded bat species. Leisler's bats were particularly recorded foraging over street lights along the main street of Ballyhale. The remaining three bat species were more associated with dense tree lines and dark areas away from the village of Ballyhale.

In summary, little bat activity was recorded associated with the river running through the town. The majority of bat activity was associated with the treelines of agricultural fields located west, south and north-east of the town. The following Google Maps display the bat encounter locations during all of the surveys completed.

Common pipistrelles were recorded foraging along the treelines and hedgerows of the agricultural land located within the survey area. Commuting routes (Red Arrows) were also recorded from the village of Ballyhale west along hedgerows.

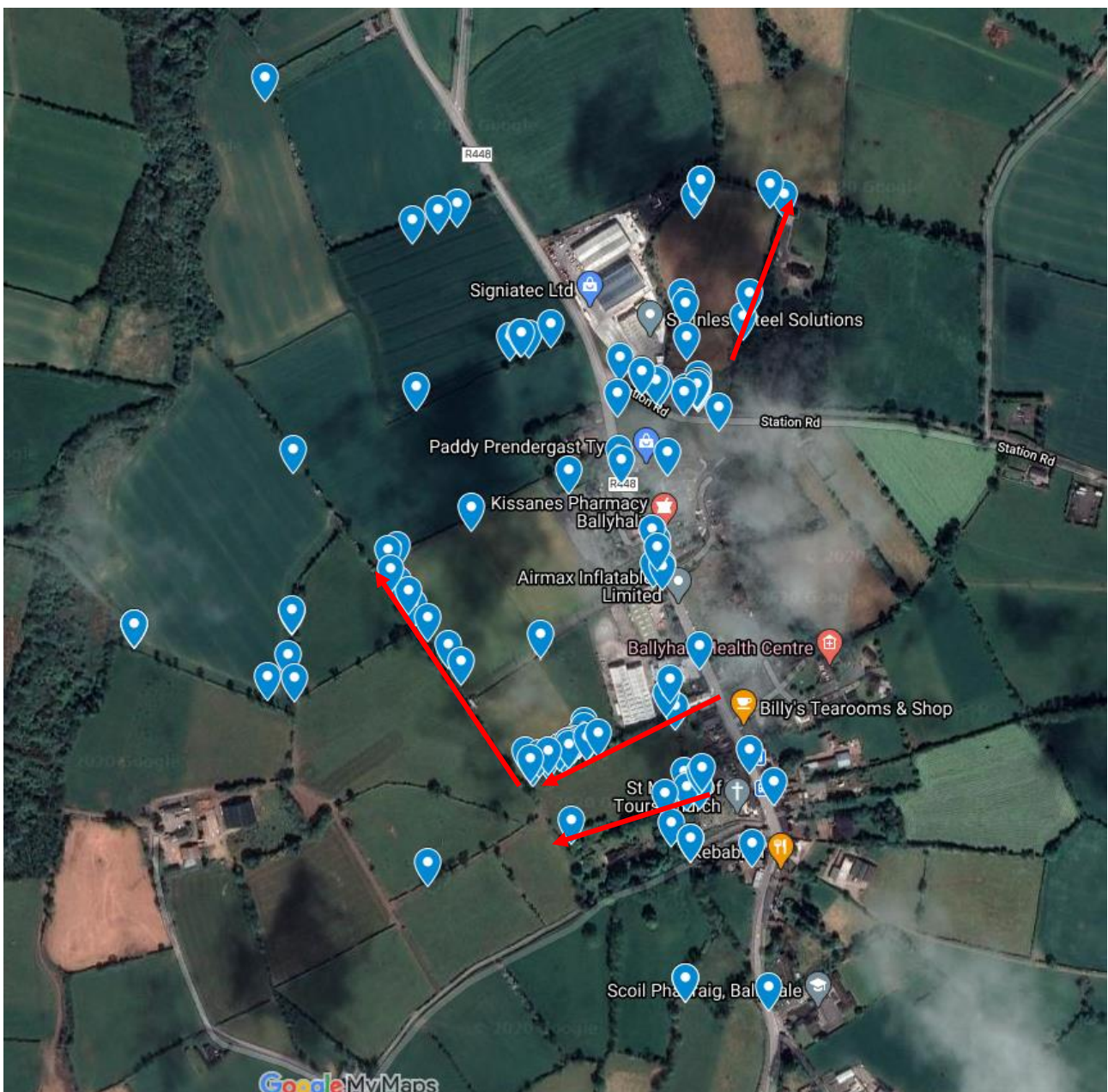


Figure 4b: Common pipistrelle bat encounters within survey area (blue Icons) & commuting routes (red arrows).

Soprano pipistrelles, similar to common pipistrelles, was recorded throughout the survey area. A high degree of activity was recorded around the mature trees located to the west of catholic church. Commuting routes (Red Arrows) were also recorded from the village of Ballyhale west along hedgerows.

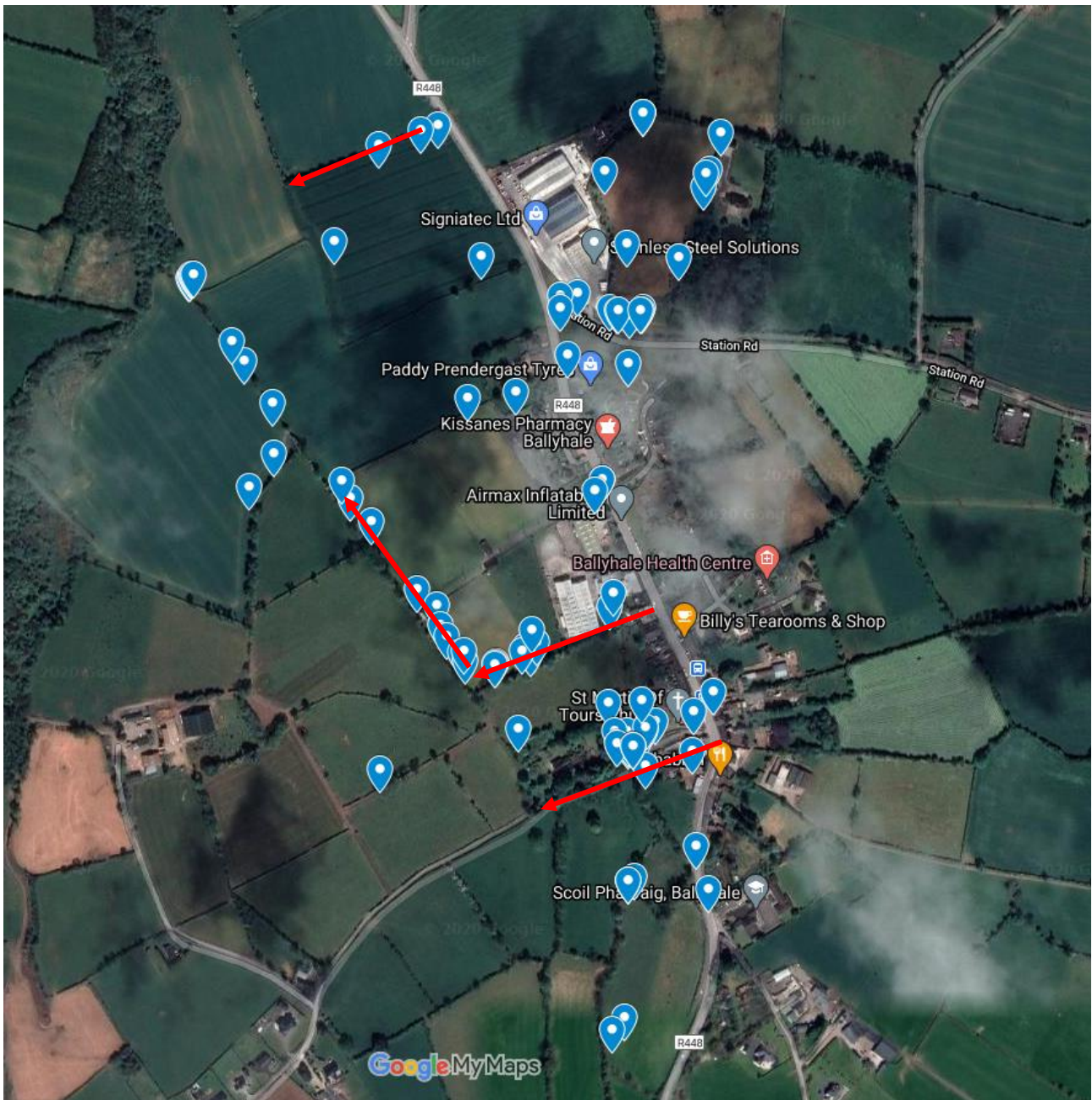


Figure 4c: Soprano pipistrelle bat encounters within survey area (blue icons) & commuting routes (red arrows).

Leisler's bats, as mentioned previously, were largely associated with the street light network of the village with consistent foraging in these areas.

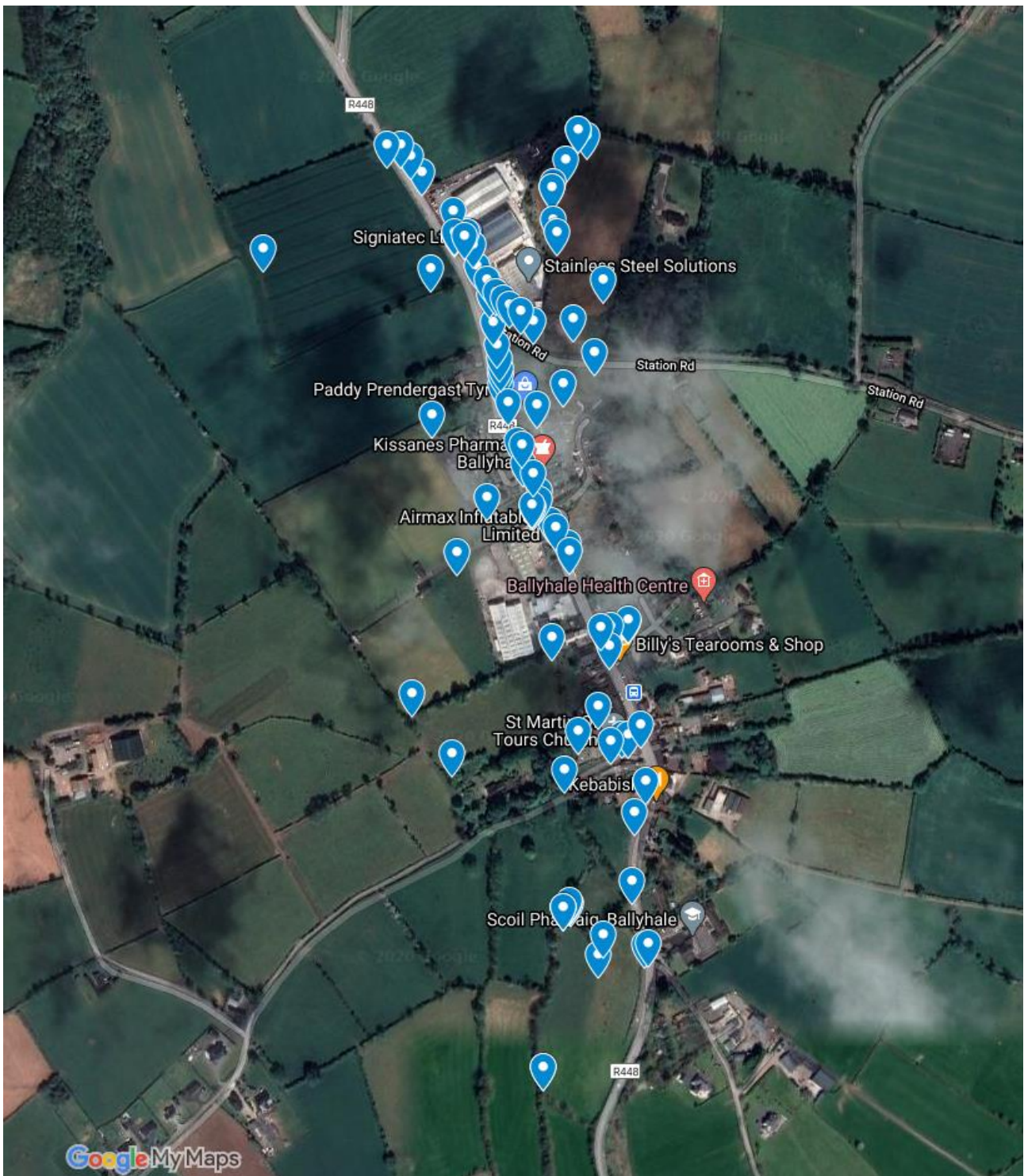


Figure 4d: Leisler's bat encounters within survey area (Blue Icons).

Daubenton's bats and Natterer's bats were recorded during the bat surveys. A high level of Natterer's bat encounters was recorded south of the village (Red Circle). There was a static unit located here recording for three nights and due the level of Natterer's bat activity, it is likely that there is a tree roost in vicinity of the static recording unit located in this area.

No Daubenton's bats was recorded on the Ballyhale River and this may be due to the degree of street lighting present. Both Natterer's bats and Daubenton's bats were only recorded in areas where there was no street lighting. Daubenton's bats and Natterer's bats are light sensitive bat species.



Figure 4e: *Myotis* species bat encounters (Natterer's bat & Daubenton's bat) within survey area (Blue Icons). Red Circle – location of static recording unit and area of high Natterer's bats encounters.

Brown long-eared bats were recorded in three areas and these areas were associated with dense treelines and also away from street lighting. This bat species is also light sensitive.



Figure 4f: Brown long-eared bat encounters within survey area (Blue Icons).

3.2.2 Passive Static Bat Detector Survey

The following table summarises the results recorded on the static units deployed (Please see Figure 5 and Appendix 2 for detailed surveillance results). The unit (SM4 U4) located across from the primary school recorded the highest number of bat species with a particularly high level of Natterer's bat activity. The unit (SM4 U3) located behind the church recorded the highest level of soprano pipistrelles and this is likely to be due to the presence of a bat roost adjacent to the church grounds. The unit (SM2 U5) located behind the logistics building recorded the highest level for common pipistrelles.

Table 11: Results of Static Bat Detectors deployed during Static Bat Detector Surveys.

Static Code	Location Description	Survey Period	Bat Species
SM4 U3	On tree to rear of church S5429935271	11 th – 14 th September 2020	Soprano pipistrelle Common pipistrelle Natterer's bat Daubenton's bat Brown long-eared bat
SM4 U4	On tree in fields across from school S5429635112	11 th – 14 th September 2020	Soprano pipistrelle Common pipistrelle Leisler's bat Natterer's bat Daubenton's bat Brown long-eared bat
SM4 U5	On tree behind logistics building S5430336017	11 th – 14 th September 2020	Soprano pipistrelle Common pipistrelle Leisler's bat
SM2 U5	On tree along river S5371635788	11 th – 14 th September 2020	FAILED TO RECORD



Figure 5: Location to static units during static surveillance.

3.3 Desktop Review

3.3.1 Bat Conservation Ireland Database

The Bat Conservation Ireland databases search provided the following records:

- 1km radius: two records (BATLAS 2010 & BAT:AS 2020) for the following bat species: soprano pipistrelle, common pipistrelle, Leisler's bat and *Myotis* species.
- 10km radius
 - o Roosts: 8 roost records (Leisler's bat, soprano pipistrelle, common pipistrelle, brown long-eared bats and whiskered bats).
 - o Transects: 7 waterway transects (Daubenton's bats, Leisler's bats and *Pipistrellus* spp).
 - o Ad Hoc: 33 Records:(Leisler's bat, soprano pipistrelle, common pipistrelle, brown long-eared bats, Daubenton's bats and Natterer's bats).

4. Bat Ecological Evaluation

4.1 Bat Species Recorded & Sensitivity

A total of six species of bats were recorded during the array of bat surveys completed within the survey area of Ballyhale, Co. Kilkenny: soprano pipistrelle, common pipistrelle, Leisler's bats, Natterer's bats, Daubenton's bats and brown long-eared bats.

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. The Daubenton's bat, considered to be a water specialist, was not recorded on the Ballyhale River flowing through the village of Ballyhale. This is likely due to the fact that there is little clear water free of vegetation and due to the high level of light pollution from street lights. This species was recorded along the dark areas of treelines to the west of the village. This was also the case for Natterer's bats and brown long-eared bats. All of these three bat species are light sensitive and therefore avoid the village of Ballyhale. While the three common bat species (common pipistrelle, soprano pipistrelle and Leisler's bats) are bat species that can tolerate artificial street lighting and therefore were recorded foraging and commuting in the village environs.

4.2 Species Profiles

4.2.1 *Leisler's bat*

This bat species was recorded commuting through the study area. Ireland's population is deemed of international importance and the paucity of knowledge of roosting sites, makes this species vulnerable. However, it is considered to be widespread across the island. The modelled Core Area for Leisler's bats is a relatively large area that covers much of the island of Ireland (52,820km²). The Bat Conservation Ireland Irish Landscape Model indicated that the Leisler's bat habitat preference has been difficult to define in Ireland. Habitat modelling for Ireland shows an association with riparian habitats and woodlands (Roche *et al.*, 2014). The landscape model emphasised that this is a species that cannot be defined by habitats preference at a local scale compared to other Irish bat species but that it is a landscape species and has a habitat preference at a scale of 20.5km. In addition, of all Irish bat species, Leisler's bats have the most specific roosting requirements. It tends to select roosting habitat with areas of woodland and freshwater.

Irish Status	Near Threatened
European Status	Least Concern
Global Status	Least Concern
Biographical Range	km ²
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	73,000 to 130,000 (2007-2013) Ireland is considered the world stronghold for this species
Estimate Core Area (Lundy <i>et al.</i> 2011)	52,820 km ²

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & NPWS, 2019

The principal concerns for Leisler's bats are poorly known in Ireland but those that are relevant for this survey area are as follows:

- Selection of maternity sites is limited to specific habitats;
- Relative to the population estimates, the number of roost sites is poorly recorded;
- Tree felling, especially during autumn and winter months; and

- Increasing urbanisation.

4.2.2 *Common pipistrelle*

This species was the most recorded species within the study area and it is generally considered to be the most common bat species in Ireland. The species is widespread and is found in all provinces. The modelled Core Area for common pipistrelles is a large area that covers much of the island of Ireland (56,485km²) which covers primarily the east and south east of the area (Roche *et al.*, 2014). The Bat Conservation Ireland Irish Landscape Model indicates that the Common pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanization (<30%) (Roche *et al.*, 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Biographical Range	km ²
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	1.2 to 2.8 million (2007-2012)
Estimate Core Area (km ²) (Lundy <i>et al.</i> 2011)	56,485

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & NPWS, 2019

Principal concerns for Common pipistrelles in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosting requirements
- This species has complex habitat requirements in the immediate vicinity of roosts. Therefore, careful site specific planning for this species is required in order to ensure all elements are maintained.
- Renovation or demolition of derelict buildings.
- Tree felling
- Increasing urbanisation (e.g. increase in lighting)

4.2.3 *Soprano pipistrelle*

This species was the second most recorded species the study area and it is generally considered to be the second most common bat species in Ireland. The species is widespread and is found in all provinces, with particular concentration along the western seaboard. The modelled Core Area for soprano pipistrelle is a large area that covers much of the island of Ireland (62,020km²). The Bat Conservation Ireland Irish Landscape Model indicates that the soprano pipistrelle selects areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.*, 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Biographical Range	km ²
Irish Population Trend	2003-2013 ↑
Estimated Irish Population Size	0.54 to 1.2 million (2007-2012)
Estimate Core Area (km ²) (Lundy <i>et al.</i> 2011)	62,020

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & NPWS, 2019

Principal concerns for Soprano pipistrelles in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosts;
- Renovation or demolition of structures;
- Tree felling; and
- Increasing urbanisation (e.g. increase in lighting).

4.2.4 *Brown long-eared Bat*

This species is generally considered to be widespread across the island. The modelled Core Area for Brown long-eared bats is a relatively large area that covers much of the island of Ireland (52,820km²) with preference suitable areas in the southern half of the island. The Bat Conservation Ireland Irish Landscape Model indicates that the Brown long-eared bat habitat preference is for areas with broadleaf woodland and riparian habitats on a small scale of 0.5km emphasising the importance of local landscape features for this species (Roche *et al.*, 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Biographical Range	km ²
Irish Population Trend	2008-2013 Stable
Biographical Range	km ²
Estimate Core Area (Lundy <i>et al.</i> 2011)	49,929 km ²

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & NPWS, 2019

Principal concerns for brown long-eared bats are poorly known in Ireland, but those that are relevant for this survey area are as follows:

- Selection of maternity sites is limited to specific habitats;
- Lack of knowledge of winter roosts;
- Loss of woodland, scrub and hedgerows;
- Tree surgery and felling;
- Increasing urbanisation; and
- Light pollution.

4.2.5 *Natterer's bat*

There are three species included in the *Myotis* species family and their echolocation calls are very similar across these three species.

The modelled Core Area for Natterer's bats is a relatively large area that covers much of the island of Ireland (52,864km²). The Bat Conservation Ireland Irish Landscape Model indicates that the Natterer's bat selects areas with broadleaf woodland, riparian habitats and areas with larger scale provision of mixed forest (Roche *et al.*, 2014). Therefore, it is likely that this species is more widespread within the survey area.

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern

Biographical Range	km ²
Irish Population Trend	Unknown
Estimated Irish Population Size	Unknown
Estimate Core Area (Lundy <i>et al.</i> 2011)	52,864

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & NPWS, 2019

Principal concerns for Natterer's bats in Ireland that are relevant for this survey area are as follows:

- Lack of knowledge of roosting requirements;
- This species has complex habitat requirements in the immediate vicinity of roosts. Therefore careful site specific planning for this species is required in order to ensure all elements are maintained;
- Tree felling; and
- Increasing urbanisation (e.g. increase in lighting).

4.2.6 *Daubenton's bat*

The modelled Core Area for Daubenton's bats is a relatively large area that covers much of the island of Ireland (41,285km²) reflecting the distribution of sizeable river catchments. The Bat Conservation Ireland Landscape Model indicates that the Daubenton's bat habitat preference is for areas with broadleaf woodland, riparian habitats and low density urbanisation (Roche *et al.*, 2014).

Irish Status	Least Concern
European Status	Least Concern
Global Status	Least Concern
Biographical Range	km ²
Irish Population Trend	2008-2013 Stable
Estimated Irish Population Size	81,000 to 103,000 (2007-2012)
Estimate Core Area (km²) (Lundy <i>et al.</i> 2011)	41,285

Taken from Roche *et al.*, 2014, Lysaght & Marnell, 2016 & NPWS, 2019

Principal concerns for Daubenton's bats are poorly known in Ireland but those that are relevant for this survey area are as follows:

- Potential roost loss due to bridge maintenance;
- Loss of woodland and forest clearance;
- Loss of woodland, scrub and hedgerows;
- Tree surgery and felling;
- Increasing urbanisation; and
- Light pollution.

5. Impact Assessment & Mitigation

The following bat species were recorded during this bat survey: common pipistrelle, soprano pipistrelle, Leisler's bat, Daubenton's bat, brown long-eared bat and Natterer's bat. This represents six of the nine resident bat species known to Ireland.

The following section rates the different flood relief options and their possible impact on local bat populations.

5.1 Route Option A (Green Route, Figure 2a)

This route consists of flow diversion as an open channel to the Little Arrigle River. This would involve treeline and hedgerow loss to the west of the village where a high level of local bat population activity was recorded. This would involve possible disturbance to large mature trees located behind the church to the west of the village where a high level of local bat population activity was recorded.

5.2 Route Option B (Red Route, Figure 2a)

This route consists of flow diversion as an open channel to the Ballyhale River. This would involve treeline and hedgerow loss to the west and north of the village where a high level of local bat population activity was recorded. This would involve possible disturbance to large mature trees located behind the church to the west of the village where a high level of local bat population activity was recorded.

5.3 Route Option C (Dashed Purple Route, Figure 2a)

This route consists of flow diversion as an open channel to the Little Arrigle River. This would involve some limited loss of sections of treelines and hedgerows to the west of the village where a high level of local bat population activity was recorded.

5.4 Route Option D (Purple Route, Figure 2a)

This route options involves an underground piped route along existing roads in the Ballyhale village. Due to the fact that there are no bats roosts associated with the culverts and bridges and that there was little bat activity recorded associated with the river, this option will have little impact on local bat populations.

5.5 Route Option E (Brown Route, Figure 2a)

This route consists of flow diversion using partially open and partially piped overflow route to the Ballyhale River. This would involve possible disturbance to large mature trees located behind the church to the west of the village where a high level of local bat population activity was recorded.

5.6 Route Option F (Blue Route, Figure 2a)

This route consists of flow diversion using upgrade work to existing channel / structures where needed. Due to the fact that there are no bats roosts associated with the culverts and bridges and that there was little bat activity recorded associated with the river, this option will have little impact on local bat populations.

5.7 Impact Assessment – Overall

The Route Options D and F would be considered to have the least impact on local bat populations compared to the other Route Options discussed above (Please see Table 12 for details).

Table 12: Potential impact of the proposed flood relief options on the different bat species recorded during survey work.

Works	SP	CP	Leis	BLE	Daub	Natt
Route Option A	Minor-Moderate	Minor-Moderate	Minor	Moderate	Moderate	Moderate
Route Option B	Minor-Moderate	Minor-Moderate	Minor	Moderate	Moderate	Moderate
Route Option C	Minor-Moderate	Minor-Moderate	Minor	Minor-Moderate	Minor-Moderate	Minor-Moderate
Route Option D	Minor	Minor	Minor	None	None	None
Route Option E	Minor-Moderate	Minor-Moderate	Minor-Moderate	Moderate	Moderate	Moderate
Route Option F	Minor-Moderate	Minor-Moderate	Minor	None	None	None

SP = soprano pipistrelle, CP = common pipistrelle, Leis = Leisler's bat, BLE = brown long-eared bat, Daub = Daubenton's bat, Natt = Natterer's bat.

5.8 Mitigation Measures

Since the Ballyhale Flood Relief Scheme project is at an early stage, the current information on the proposed works is limited and therefore detailed mitigation measures are not provided. The following general measures should be adhered to when selecting a preferred route and for the detailed design and construction of any flood relief scheme:

- Minimise the potential impact of proposed works on mature trees, treelines and hedgerows. Protect trees and their roots from proposed works. Any trees that required to be felled should be assessed for the Potential Bat Roost (PBR) level prior to felling and alternative roosting sites should be provide (e.g. bat boxes).
- Undertake additional bat survey work on any buildings that may be impacted by proposed works.
- Restrict the usage of artificial lighting in work zones and ensure that such are turned off during the hours of darkness.
- Any removal of treelines and hedgerows requires landscape replacement (native tree and shrub species).

This section should be re-addressed when greater detail is provided in relation to the preferred route option.

6. Survey Conclusions

The following bat species were recorded during this bat survey: common pipistrelle, soprano pipistrelle, Leisler's bat, Daubenton's bat, brown long-eared bat and Natterer's bat. This represents six of the nine resident bat species known to Ireland.

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.

The flood relief route options were assessed in relation to potential impact on local bat populations. Due to the fact that the majority of bat activity was recorded west and north of the village of Ballyhale, any route options that involve loss of treelines and hedgerows will impact on local bat populations due to the removal of commuting routes and foraging habitat.

Therefore it is considered, in relation to the conservation of local bat populations, the route options that involve upgrading the existing channel and structures within the village environs will have less of an impact on local bat populations.

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8. Appendices

Appendix 1 Bat Habitat & Commuting Route Classifications

Table 1.A: Hedgerow Category (Bat Conservation Ireland, 2015)

Type of Hedgerow / Treeline	Code	Description / Bat Potential
Small Hedgerow	SH	<p>Hedgerow is less than approximately 1.5 m high, there are no, or very few, protruding bushes or trees. This type of hedgerow would provide little shelter to bats.</p> 
Medium Hedgerow	MH	<p>Hedgerow is approximately 1.5 to 3 m high. This type of hedgerow will provide foraging and commuting potential for bats.</p> 
Sparse Treeline Hedgerow	ST	<p>Hedgerow, low or medium in height, with individual trees (where tree canopies, for the most part, do not touch).</p>



		
<p>Dense Treeline Hedgerow</p>	<p>DT</p>	<p>Large uncut hedgerows or treelines, dominated by mainly large tree or very tall scrub species (e.g. tall hawthorn, blackthorn or hazel), where the canopies are mostly touching.</p> 

Table 1.B: Habitat Classification (Bat Conservation Ireland, 2015, based on Fossit, 2000)

Cultivated land		Salt marshes		Exposed rock		Fens/flushes	
Built land		Brackish waters		Caves		Grasslands	
Coastal structures		Springs		Freshwater marsh		Scrub	
Shingle/gravel		Swamps		Lakes/ponds		Hedges/treelines	
Sea cliffs/islets		Disturbed ground		Heath		Conifer plantation	
Sand dunes		Watercourse		Bog		Woodland	

Appendix 1 Table A : Static Surveillance Results

Date	SP	CP	Leis	Daub	Natt	BLE	Location
11/09/2020	1908	157	0	0	1	1	S5429935271
12/09/2020	545	839	0	1	0	0	
13/09/2020	1213	675	0	3	0	2	
Total	3666	1671	0	4	1	3	
SM4 U3							
Date	SP	CP	Leis	Daub	Natt	BLE	Location
11/09/2020	175	95	2	5	50	1	S5429635112
12/09/2020	231	236	9	20	126	2	
13/09/2020	248	423	4	27	129	0	
Total	654	754	15	52	305	3	
SM4 U4							
Date	SP	CP	Leis	Daub	Natt	BLE	Location
11/09/2020	63	729	0	0	0	0	S5430336017
12/09/2020	32	1206	4	0	0	0	
13/09/2020	47	1243	1	0	0	0	
Total	142	3178	5	0	0	0	
SM5							
Date	SP	CP	Leis	Daub	Natt	BLE	Location
11/09/2020	0	0	0	0	0	0	S5371635788
12/09/2020	0	0	0	0	0	0	
13/09/2020	0	0	0	0	0	0	
Total	0	0	0	0	0	0	
SM4U6							

9. Photograph Catalogue



Plate A: Freshwater crayfish under Bridge 3, Ballyhale, Co. Kilkenny.