



RIVER BRIDE (BLACKPOOL) CERTIFIED DRAINAGE SCHEME

ENVIRONMENTAL IMPACT STATEMENT

**- VOLUME 2 -
MAIN REPORT**

NOVEMBER 2015

Prepared By:

RYAN HANLEY

In Association With:



TABLE OF CONTENTS

1	INTRODUCTION	1-1
1.1	Introduction	1-1
1.2	Brief Description of The Proposed Development	1-1
1.3	Purpose and Scope of the EIS	1-3
1.4	Structure and Content of the EIS	1-3
1.4.1	General Structure	1-3
1.4.2	Description of Impacts	1-3
1.5	Project Team	1-5
1.5.1	Project Team Responsibilities	1-5
2	BACKGROUND OF THE PROPOSED SCHEME	2-1
2.1	Site of the Proposed Development	2-1
2.1.1	Site Location	2-1
2.1.2	Site Access	2-1
2.1.3	Physical Characteristics of Site and Surrounding Lands	2-1
2.2	Need for the Proposed Development	2-2
2.3	Strategic Planning and Development Context	2-3
2.3.1	National Level	2-3
2.3.2	Regional Level	2-3
2.3.3	Local Level	2-4
2.4	Scheme Design Process	2-4
2.5	Constraints Study	2-5
2.6	Consideration of Alternatives	2-4
2.6.1	Options Report	2-9
2.6.2	Possible Flood Risk Management Methods	2-10
2.7	Scoping & Consultation	2-12
2.7.1	Constraints Study Scoping	2-12
2.7.2	First Public Information Day	2-13
2.7.3	Advertising of Public Consultation	2-13
2.7.4	Literature Available for the Consultation	2-13
2.7.5	Public Consultation Exhibition Posters	2-13
2.7.6	Public Attendees and Response to Public Information Day	2-14
2.7.7	Second Public Information Day	2-14
2.7.8	EIA Scoping	2-15
2.7.9	Scoping Responses	2-16
3	DESCRIPTION OF THE PROPOSED DEVELOPMENT	3-1
3.1	Proposed Works	3-1
3.1.1	Site Investigation	3-2
3.1.2	Culverts	3-2
3.1.3	Bridge Replacement	3-2
3.1.4	Flood Walls/ Embankments	3-3
3.1.5	Bridge Parapets	3-5
3.1.6	Winter Channel	3-4
3.1.7	Sedimentation Management	3-5
3.1.8	Open Channel	3-6
3.1.9	Screens	3-6
3.1.10	Drainage Works	3-7
3.1.11	Maintenance Regime	3-7
3.2	Anticipated Construction Methods	3-9
3.2.1	New Culvert	3-9

3.2.2	Bridge Replacement	3-9
3.2.3	Bridge Parapets	3-10
3.2.4	Flood Defence Walls	3-10
3.2.5	Earthen Embankments	3-11
3.2.6	Drainage Works	3-11
3.2.7	Pumping Stations	3-11
3.2.8	Other Instream Works	3-12
3.3	Construction Programme and Sequencing of Proposed Works	3-12
3.4	Temporary Construction Works Facilities	3-13
3.5	Estimated Cost of Proposed Works	3-13
4	HUMAN BEINGS	4-1
4.1	Introduction	4-1
4.2	Receiving Environment	4-1
4.2.1	Methodology	4-1
4.3	Human Beings in the Existing Environment	4-2
4.3.1	Study Area	4-2
4.3.2	Settlement and Planning Policy	4-2
4.3.3	Population	4-3
4.3.4	Employment and Economic Activity	4-5
4.3.5	Land use	4-8
4.3.6	Services	4-8
4.3.7	Education	4-8
4.4	Tourism	4-9
4.4.1	Tourist Numbers and Revenue	4-9
4.4.2	Tourist Attractions	4-12
4.5	Health and Safety	4-12
4.6	Likely and Significant Impacts on Human Beings and associated Mitigation measures	4-12
4.4.1	'Do-Nothing' Scenario	4-13
4.4.2	Construction Phase	4-13
4.4.3	Operational Phase	4-20
5	FLORA & FAUNA	5-1
5.1	Introduction	5-1
5.2	Methodology and Limitations	5-1
5.2.1	Desk study	5-1
5.2.2	Field Survey	5-2
5.2.3	Designated Areas in the Vicinity of the Study Area	5-3
5.2.4	Non Designated Features of Ecological Interest	5-4
5.2.5	Flora	5-5
5.2.6	Fish and Shellfish	5-6
5.2.7	Birds	5-7
5.2.8	Mammals	5-8
5.2.9	Water Quality	5-9
5.3	Field Surveys	5-9
5.3.1	Habitats and Flora	5-10
5.3.2	Significance of Flora	5-14
5.3.3	Fauna	5-15
5.3.4	Significance of Fauna	5-19
5.4	Impacts and Mitigation Measures	5-20
5.4.1	Do Nothing Scenario	5-20
5.4.2	Impact on Loss of Habitat	5-20
5.4.3	Impact on Floral Species	5-24

5.2.4	Impact on Fauna	5-25
5.4.5	Impact on Fisheries	5-27
6	GEOLOGY AND SOILS IN THE EXISTING ENVIRONMENT	6-1
6.1	Methodology & Limitations	6-1
6.1.1	Published Material	6-1
6.1.2	Definitions	6-2
6.2	Geology	6-2
6.2.1	Geomorphology	6-2
6.2.2	Bedrock Geology	6-3
6.2.3	Geological Heritage	6-3
6.2.4	Economic Geology	6-4
6.2.5	Geohazards	6-4
6.2.6	Quaternary Geology (Subsoil)	6-4
6.2.7	Potential Impacts on Geology	6-5
6.3	Soils	6-7
6.3.1	Soil Formation	6-8
6.3.2	Soil Associations	6-8
6.3.3	Potential Impacts on Soil	6-9
6.4	Hydromorphology	6-10
6.4.1	Hydromorphological Characteristics	6-10
6.4.2	Potential Impacts on Hydromorphology	6-11
7	WATER - HYDROLOGY & HYDROGEOLOGY	7-1
7.1	Introduction	7-1
7.2	Surface Water Quality	7-1
7.2.1	Legislative Review	7-1
7.2.2	Methodology	7-4
7.2.3	Description of the Study Area	7-5
7.2.4	Impacts and Mitigation for Surface Water Quality	7-11
7.3	Hydrogeology	7-12
7.3.1	Methodology	7-12
7.3.2	Hydrology in the Existing Environment	7-12
7.3.3	Potential Impacts on Hydrogeology	7-15
7.4	Flooding	7-16
7.4.1	Methodology	7-16
7.4.2	Flooding and Hydrology in the Existing Environment	7-16
7.4.3	Potential Impacts on Flooding	7-18
8	AIR QUALITY & CLIMATE / NOISE & VIBRATION	8-1
8.1	Air Quality & Climate - Existing Environment	8-2
8.2	Noise & Vibration - Existing Environment	8-6
8.2.1	Noise Receptors	8-6
8.2.2	Noise Survey Methodology	8-8
8.2.3	Results	8-17
8.3	Assessment Criteria	8-17
8.3.1	Air Quality & Climate	8-17
8.3.2	Noise Criteria	8-21
8.3.3	Vibration Criteria	8-23
8.4	Potential Impacts	8-24
8.4.1	Air Quality & Climate	8-24
8.4.2	Noise Sources	8-26
8.4.3	Noise Impacts	8-27

8.4.4	Vibration Impacts	8-30
8.5	Mitigation Measures	8-31
8.5.1	Air Quality & Climate	8-12
8.5.2	Noise & Vibration	8-32
8.6	Residual Impact	8-33
8.6.1	Air Quality & Climate	8-33
8.6.2	Noise & Vibration	8-33
8.7	MONITORING	8-33
8.7.1	Air Quality & Climate	8-33
8.7.2	Noise & Vibration	8-33
9	LANDSCAPE	9-1
9.1	Introduction	9-1
9.1.1	Proposed Works	9-1
9.1.2	Study Area	9-1
9.2	Methodology	9-1
9.2.1	Guidance Documents	9-2
9.2.2	Baseline Landscape Assessment	9-3
9.2.3	Visibility of the Proposed Development	9-3
9.2.4	Assessment of Potential Impacts	9-4
9.3	Receiving Environment	9-2
9.3.1	Cork City Landscape Study 2008	9-5
9.3.2	Cork City Development Plan 2014-2020	9-5
9.3.3	Landscape Character Areas	9-5
9.3.4	Key Landscape Assets	9-6
9.3.5	Landscape Protection Designations	9-7
9.3.6	Protected Views	9-10
9.4	Landscape Character	9-12
9.4.1	Physical Unit	9-12
9.4.2	Topography	9-12
9.4.3	Drainage	9-15
9.4.4	Geological Processes	9-15
9.4.5	Visual Unit	9-21
9.4.6	Landscape Value and Sensitivity	9-21
9.4.7	Landscape and Site Context	9-22
9.5	Photomontages	9-29
9.5.1	Limitations of Photomontages	9-29
9.5.2	Location of Photomontages	9-29
9.6	Likely and Significant Impacts and Associated Mitigation Measures	9-59
9.6.1	'Do-Nothing' Scenario	9-59
9.6.2	Impacts During the Construction Phase	9-59
9.6.3	Site Investigation and Construction works -Construction Traffic, Materials and Temporary Site Buildings	9-59
9.6.4	Impacts During the Operational Phase	9-60
10	CULTURAL HERITAGE	10-1
10.1	Introduction	10-1
10.2	Assessment Methodology	10-1
10.2.1	Introduction	10-1
10.2.2	Desktop Survey	10-1
10.2.3	Field Survey	10-2
10.2.4	Cultural Heritage Impact Criteria	10-2

10.3	The Existing Environment	10-2
10.3.1	Introduction	10-2
10.3.2	Legal Status	10-3
10.3.3	Desktop Survey	10-7
10.3.4	Field Survey	10-14
10.4	Potential Impacts	10-18
10.4.1	Works Area in General	10-18
10.4.2	Blackpool Village	10-18
10.4.3	Sunbeam Industrial Park and Dulux Factory	10-19
10.4.4	Fitz's Boreen Road Bridge	10-20
10.4.5	Kilnap Glen House Property	10-21
11	MATERIAL ASSESTS IMPACT ASSESSMENT	11-1
11.1	Receiving Environment	11-1
11.2	Traffic & Roads	11-1
11.2.1	Description of Project and Roads Network	11-2
11.2.2	Existing Traffic	11-3
11.2.3	Construction Traffic	11-4
11.2.4	Potential Impacts on Traffic and Transport Infrastructure	11-5
11.3	Potential Impacts on Services & Proposed Mitigation Measures	11-9
11.3.1	Potential impact on Drainage Network	11-9
11.3.2	Potential Impact to the Water Distribution Network	11-10
11.3.3	Potential Impact to the Gas Network	11-11
11.3.4	Potential Impact to the Electricity Network	11-13
11.3.5	Potential Impact to the Broadband Network	11-14
11.3.6	Potential Impact to the Telecommunications Network	11-15
11.4	Waste Management During Construction Phase	11-17
11.4.1	Background Information	11-17
11.4.2	Classification of Waste	11-17
11.4.3	Potential Impact during Construction Phase	11-18
11.4.4	Potential Impact during Operational Phase	11-20
12	INTERACTION OF THE FOREGOING	12-1

Chapter 1:

Introduction

1 INTRODUCTION

1.1 INTRODUCTION

This Environmental Impact Statement (EIS) has been prepared by Ryan Hanley in association with McCarthy Keville O'Sullivan Ltd. on behalf of the Office of Public Works (OPW). The Office of Public Works (OPW) is the lead agency for flood risk management in Ireland. The coordination and implementation of the Government's policy on the management of flood risk in Ireland, in conjunction with its responsibilities under the Arterial Drainage Acts, 1945-1995, form one of the four core services of the OPW.

Ryan Hanley in association with McCarthy Keville O'Sullivan Ltd. were appointed as Planning and Environmental Consultants on this project and commissioned to prepare an Environmental Impact Statement (EIS), which fulfils the requirements set out by the Environmental Protection Agency (EPA) in the 'Guidelines on the Information to be contained in Environmental Impact Statements' (EPA, 2002) and Schedule 6 of the Planning and Development Regulations 2001, relating to the information to be contained in an EIS. Reference has also been made to the 'Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment', published by the Department of the Environment, Community and Local Government in March 2013. This EIS will be put on public display in accordance with the Arterial Drainage Act (1945) and Amendment Act (1995), in Blackpool Library for a period of four weeks.

This Environmental Impact Statement has been prepared in line with the requirements of the newly amended Environmental Impact Assessment (EIA) Directive (2014/52/EU), which entered into force on 15 May 2014, and Directive 2011/92/EU of 13th December 2011 on the assessment of the effects of certain public and private projects on the environment.

This EIS has been prepared on behalf of the Office of Public Works (OPW). The OPW is a publicly funded body formed in 1831, one of whose responsibilities is the design, construction and implementing of drainage schemes throughout Ireland. They have extensive experience in successfully undertaking such projects nationwide. They carried out large arterial drainage schemes on Irish river systems as early as the mid 19th century. In addition to Flood Risk Management, the OPW is responsible for Estate Portfolio Management and Heritage Services, and the National Procurement Service.

1.2 BRIEF DESCRIPTION OF THE PROPOSED DEVELOPMENT

The design of the proposed River Bride (Blackpool) Certified Drainage Scheme has evolved through an initial screening process of a range of potential engineering measures typically considered for flood alleviation schemes, the development of potential options and finally the development of an emerging preferred scheme design.

The proposed scheme will consist of a combination of flood walls, culverting a section of open channel, bridge replacement, embankment construction and other minor works. The Preferred Option will be designed to cater for the 1% Annual Exceedance Probability (AEP) flood event (also known as the 100 year flood event). The design of the proposed works has considered the future adaptability of the scheme

for the potential impacts of future climate change in accordance with Office of Public Works guidance in relation to climate change and also includes an allowance for freeboard.


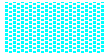

In summary the preferred flood relief scheme will involve the following proposed works:

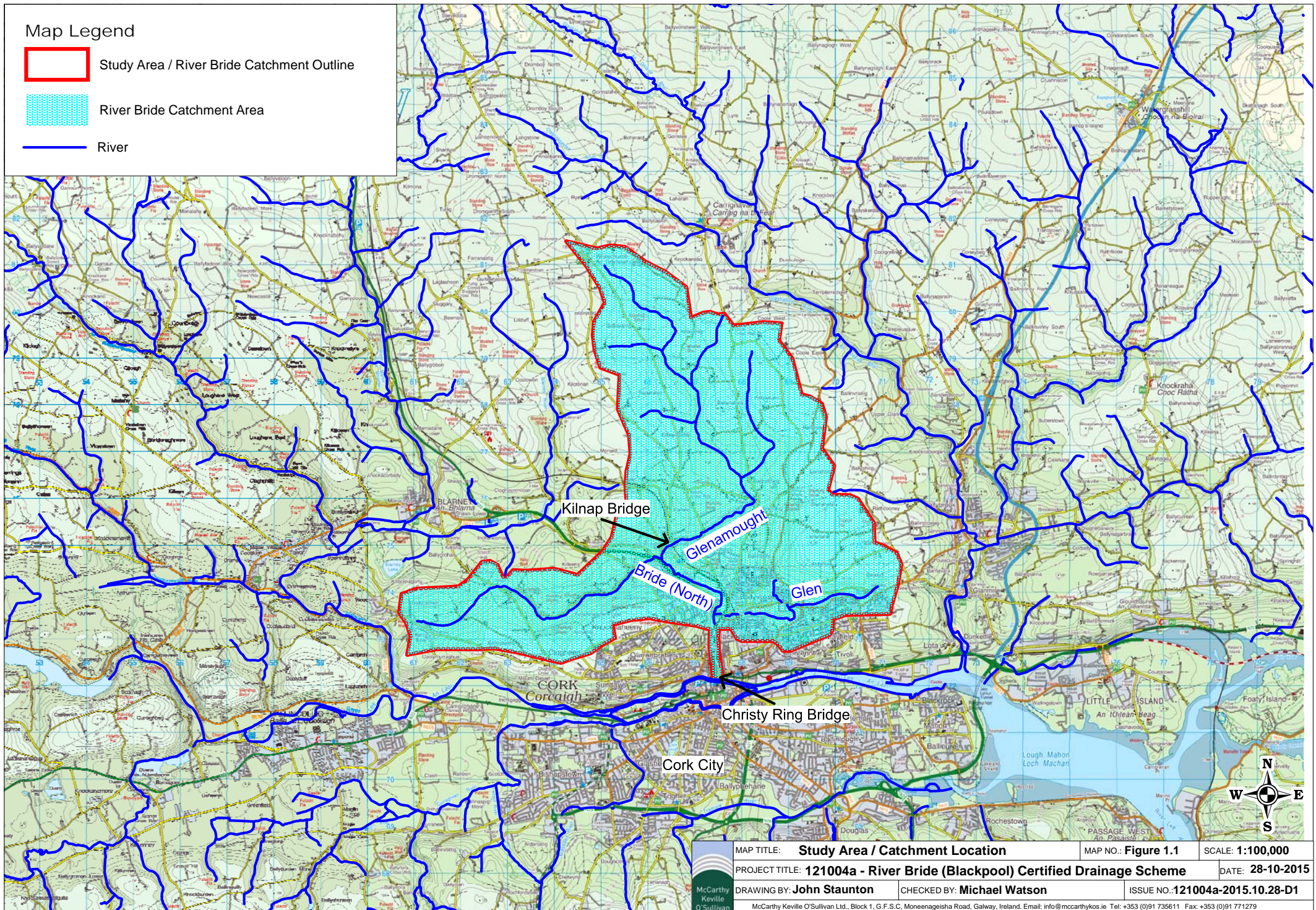
- Site investigation,
- Construction of new culverts,
- Replacement of existing bridges/ culverts,
- Construction of new flood walls/ earthen embankments,
- Constructing bridge parapets,
- Local channel widening of the River Bride (referred to as a 'Winter Channel' on the scheme drawings in Appendix 3A),
- Construction of a sedimentation trap on the left bank of the River Bride,
- Removal of approximately 100m of existing culvert and restoration of open channel (River Bride) at this location,
- Construction of a new trash screen and roughing screens, and removal of existing trash screens on the River Bride, and the Glen and Glenamought Rivers,
- Modifications to the existing foul and surface water collection networks in the vicinity of the proposed works, including construction of pumping stations, in order to prevent flooding,
- Removal of an existing sluice structure in the channel of the River Bride to the rear of the Dulux factory,
- Localised regrading of ground levels, erection of fencing and access gates, to facilitate pedestrian/ vehicular access to and around flood defences, or to redirect overland surface water flow paths,
- Filling in an existing open watercourse,
- Introduction of a flow control structure on the entrance to the Brewery culvert on the River Bride and the Spring Lane culverted branch of the River Glen, and
- Regular maintenance of the river channel and pumping stations.

The description of the scheme is provided in more detail in Chapter 3 – Description of the Proposed Development.

Initially, the River Bride (Blackpool) Certified Drainage Scheme formed part of the greater Lower Lee Flood Relief Scheme. A constraints study was carried out as part of this larger project. The Study Area at this constraints study stage was described as 'the channel, floodplain and immediate surrounding areas of the River Lee from the Inniscarra Dam extending along the main channel of the river'. When the River Bride (Blackpool) Certified Drainage Scheme was pursued as a separate project to the Lower Lee Flood Relief Scheme, the Study Area for the proposed scheme encompassed a large area covering the entire catchment of the River Bride (including its tributaries, the Glenamought and the Glen) in order to allow for the consideration of all potential scheme options and their various impacts on the receiving environment. The catchment which drains into Blackpool is shown on Figure 1.1. As the scheme design progressed based on feedback from the constraints study and other relevant assessments, the Study Area was refined to a more specific area, within which impacts may arise. For most studies conducted as part of this EIS, the Study Area was reduced to the channel and immediate surrounding areas of the River Bride extending from downstream of Kilnap Bridge, downstream through Blackpool, to the confluence with the River Lee at the

Map Legend

-  Study Area / River Bride Catchment Outline
-  River Bride Catchment Area
-  River



MAP TITLE: **Study Area / Catchment Location**

MAP NO: **Figure 1.1**

SCALE: **1:100,000**

PROJECT TITLE: **121004a - River Bride (Blackpool) Certified Drainage Scheme**

DATE: **28-10-2015**

DRAWING BY: **John Staunton**

CHECKED BY: **Michael Watson**

ISSUE NO: **121004a-2015.10.28-D1**

McCarthy Keville O'Sullivan Ltd., Block 1, G.F.S.C. Moneenagish Road, Galway, Ireland. Email: info@mccarthykies.ie Tel: +353 (0)91 735611 Fax: +353 (0)91 771279

Ordnance Survey Ireland Licence No. AR 0021815 © Ordnance Survey Ireland/Government of Ireland

Christy Ring Bridge. The Study Area for each aspect of the receiving environment is defined in each chapter of the EIS in order to clarify the extent of the area assessed for impacts relating to the proposed works.

1.3 PURPOSE AND SCOPE OF THE EIS

The purpose of this EIS is to document the current state of the environment in the vicinity of the proposed development site in an effort to quantify the possible effects, if any, of the proposed development on the environment. The assessment process that led to the compilation of this document served to highlight any areas where mitigation measures may be necessary in order to protect the surrounding environment from any negative impacts of the proposed development.

The objective of this process is to facilitate the most efficient and positive design of the proposed scheme in order to enable the scheme to be incorporated into the receiving environment insofar as possible and to plan for the identified effects so that measures are in place to ensure that any adverse impacts are avoided, reduced or remedied as appropriate.

1.4 STRUCTURE AND CONTENT OF THE EIS

1.4.1 General Structure

This EIS uses the grouped structure method to describe the existing environment, the potential impacts of the proposed development thereon and the proposed mitigation measures. Background information relating to the proposed development, scoping and consultation undertaken and a description of the proposed development are presented in separate sections. The grouped format sections describe the impacts of the proposed development in terms of human beings, flora and fauna, soils and geology, water, air and climate, noise, landscape, cultural heritage and material assets such as traffic and transportation, along with the interaction of the foregoing.

The EIS also includes a non-technical summary, which is a condensed and easily comprehensible version of the EIS document. The non-technical summary is laid out in a similar format to the main EIS document and comprises a description of the proposed development followed by the existing environment, impacts and mitigation measures presented in the grouped format.

1.4.2 Description of Impacts

As stated in the 'Guidelines on the Information to be contained in Environmental Impact Statements' (EPA, 2002), an assessment of the likely impacts of a proposed development is a statutory requirement of the EIA process. The statutory criteria for the presentation of the characteristics of potential impacts requires that potential significant impacts are described with reference to the extent, magnitude, complexity, probability, duration, frequency, reversibility and transfrontier nature (if applicable) of the impact.

The classification of impacts in this EIS will follow the definitions provided in the Glossary of Impacts contained in the following guidance documents produced by the Environmental Protection Agency (EPA):

- 'Advice Notes on Current Practice in the Preparation of Environmental Impact Statements' (EPA, 2003)
- 'Guidelines on the Information to be contained in Environmental Impact Statements' (EPA, 2002)

Table 1.1 presents the glossary of impacts as published in the EPA guidance documents. Standard definitions are provided in this glossary, which permit the evaluation and classification of the quality, significance, duration and type of impacts associated with a proposed development on the receiving environment. The use of pre-existing standardised terms for the classification of impacts ensures that the EIA employs a systematic approach, which can be replicated across all disciplines covered in the EIS, as advised in 'Guidelines on the Information to be contained in Environmental Impact Statements' (EPA, 2002). The consistent application of terminology throughout the EIS facilitates the assessment of the proposed development on the receiving environment.

Table 1.1 Impact Classification Terminology (EPA, 2002/3)

Impact Characteristic		Description
Quality	Positive	A change which improves the quality of the environment
	Neutral	A change which does not affect the quality of the environment
	Negative	A change which reduces the quality of the environment
Significance	Imperceptible	An impact capable of measurement but without noticeable consequences
	Slight	An impact which causes noticeable changes in the character of the environment without affecting its sensitivities
	Moderate	An impact that alters the character of the environment in a manner consistent with existing and emerging trends
	Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment
	Profound	An impact which obliterates sensitive characteristics
Duration	Short-term	Impact lasting one to seven years
	Medium-term	Impact lasting seven to fifteen years
	Long-term	Impact lasting fifteen to sixty years
	Permanent	Impact lasting over sixty years
	Temporary	Impact lasting for one year or less
Type	Cumulative	The addition of many small impacts to create one larger, more significant impact
	'Do Nothing'	The environment as it would be in the future should no development of any kind be carried out
	Indeterminable	When the full consequences of a change in the environment cannot be described

Impact Characteristic		Description
	Irreversible	When the character, distinctiveness, diversity, or reproductive capacity of an environment is permanently lost
	Residual	Degree of environmental change that will occur after the proposed mitigation measures have taken effect
	Synergistic	Where the resultant impact is of greater significance than the sum of its constituents
	'Worst Case'	The impacts arising from a development in the case where mitigation measures substantially fail.

Each impact is described in terms of its quality, significance, duration and type, where possible. A 'Do-Nothing' impact is also predicted in respect of each environmental theme in the EIS. Residual impacts are also presented following any impact for which mitigation measures are prescribed. The remaining impact types are presented as required or applicable throughout the EIS.

1.5 PROJECT TEAM

1.5.1 Protect Team Responsibilities

The companies and staff listed in Table 1.2 were responsible for completion of the EIA of the proposed development. Further details regarding project team members are provided below.

Table 1.2 Project Team

Consultants	Principal Staff Involved in Project	EIS Input
Ryan Hanley Consulting Engineers Sherwood House, Sherwood Avenue, Taylor's Hill, Galway	Jonathan Reid Sinead Gavin Sarah Mullen Kathy Carney	EIS Project Managers, Co-ordination and editing of EIS, Scoping and consultation, EIS Sections 3, 5, 6, 7, 10 & 11
McCarthy Keville O' Sullivan Ltd. Block 1 GFSC, Moneenageisha Road, Galway	Brian Keville Michael Watson Evelyn Sikora John Staunton	EIS Sections 1, 2, 4, 8, 9 & 12: Introduction, Background, Human Beings, Air, Climate & Noise, and Interaction of Foregoing
ARUP Consulting Engineers 15 Oliver Plunkett Street, Cork	Ken Leahy Alan Leen Darragh Ryan	Scheme Design
JBA Consulting 24 Grove Island Corbally, Limerick, Co Limerick	Jonathan Cooper Elizabeth Russell David Forde Joanne Cullinane Seb Bentley	Hydrology

Consultants	Principal Staff Involved in Project	EIS Input
John Cronin & Associates 3a Westpoint Trade Centre, Link Road, Ballincollig, Cork	John Cronin Tony Cummins	Cultural Heritage Section
Damian Brosnan Acoustics Shronagreehykealkill, Bantry, Co. Cork	Damian Brosnan	EIS Section 9: Noise
Proviz Courthouse Rd., Kinvara, Co. Galway	Mel Durkan	Photomontages

Chapter 2:

Background of Proposed Scheme

2 BACKGROUND TO THE PROPOSED DEVELOPMENT

2.1 SITE OF THE PROPOSED DEVELOPMENT

2.1.1 Site Location

The site of the proposed drainage works is located almost completely within the environs of Cork City, with a small part of it located within the townlands of Killeens and Rathpeacon County Cork. The overall study area, which covers the full catchment area for the River Bride (north) extends into both Cork City and County. Site location maps are presented in Figures 2.1 and 2.2. Figure 2.3 shows an aerial view of the proposed development site. Where the 'site' is referred to in this Environmental Impact Statement (EIS), this refers to the Study Area for the assessments undertaken in order to prepare the EIS. During the course of the assessment process, the Study Area was refined to account for the more specific area within which impacts were likely to arise, on the basis of the proposed scheme. For the purposes of this Environmental Impact Statement (EIS) document the wider Study Area is presented, but within the introduction to each chapter the specific and relevant parts of the Study Area to each chapter are further defined. For the purposes of providing background information on the project in this chapter, the 'study area' relates to the entire catchment of the River Bride (North) upstream of Blackpool.

The population density is generally high within the study area due to the location within and adjacent to Cork City, and the main urban centres include Blackpool and Ballyvolane, Cork. The Grid Reference co-ordinates for the approximate centre of the catchment study area are E168,000 N76,000. The land within the Study Area falls generally towards the river Bride and its tributaries, the Glenamought and Glen Rivers. The Rivers have a relatively flat gradient within the Cork City area, where the proposed works will take place. The culverted system in Blackpool has been incrementally constructed since the early the 1980s as part of the Glen-Bride-Kiln River Improvement Scheme which was commissioned by Cork Corporation in 1981.

2.1.2 Site Access

The proposed development site is accessed via several routes along the length of the works. Various local roads provide most of the direct site access, while the N20 national road runs in a northwest-southeast direction near the site. In addition, the R535 regional road approaches the eastern side of the study area. The wider area and Cork City are served by the M8 motorway, and the N8, N40, N22, N71, N27 and N28 national roads.

2.1.3 Physical Characteristics of Site and Surrounding Lands

The proposed works area is located within the Landscape Character Area: City, Harbour and Estuary (LCA No. 19), as set out in the Draft Landscape Strategy for County Cork. The City, Harbour and Estuary LCA forms part of the general Landscape Type: City, Harbour and Estuary (Type 1). The City, Harbour and Estuary Landscape Type extends east and southeast from Cork City and in the areas surrounding Cork Harbour. The proposed works area is found in the western-most areas of this LCA.

The topography of the catchment area is undulating in most areas, with most areas sloping towards the rivers. The catchment area elevations are in the range 25 to 188 metres O.D. in general.

Current land-use in the area surrounding the proposed works comprises mainly residential and commercial development with some areas of recreational ground. Continuous urban fabric occurs throughout the area.

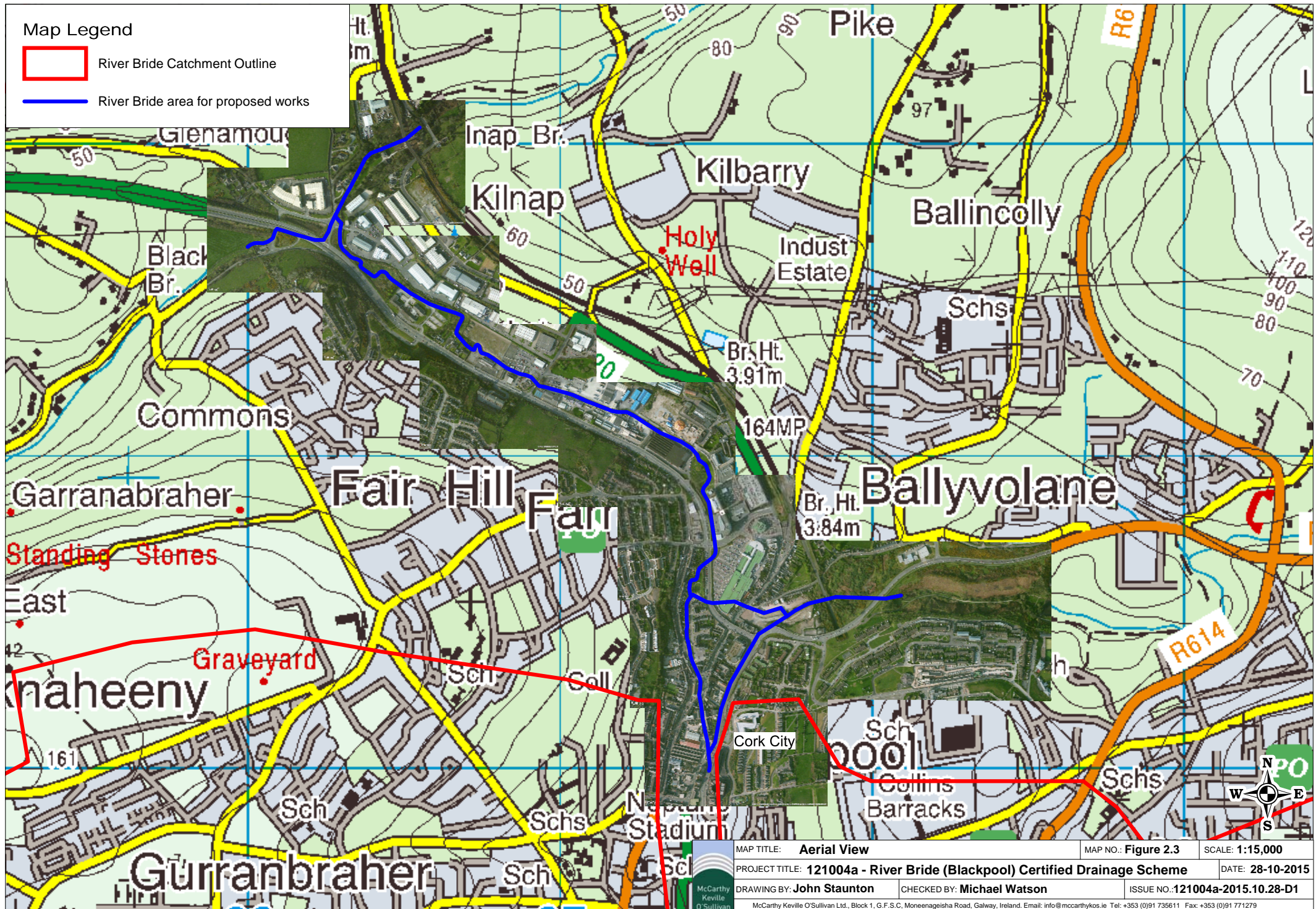
Map Legend



River Bride Catchment Outline



River Bride area for proposed works



MAP TITLE: Aerial View

MAP NO.: Figure 2.3

SCALE: 1:15,000

PROJECT TITLE: 121004a - River Bride (Blackpool) Certified Drainage Scheme

DATE: 28-10-2015

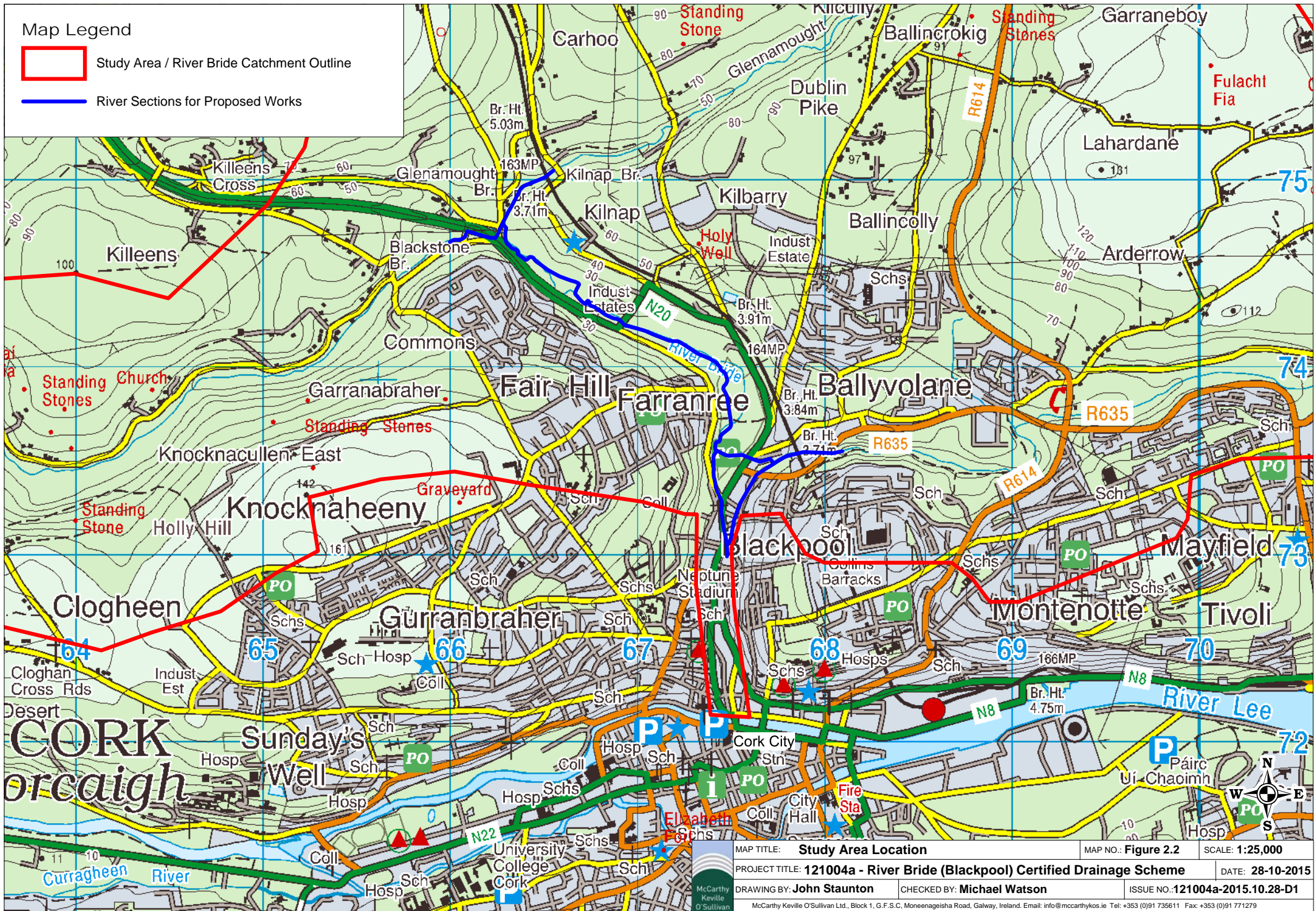
DRAWING BY: John Staunton

CHECKED BY: Michael Watson

ISSUE NO.: 121004a-2015.10.28-D1

McCarthy Keville O'Sullivan Ltd., Block 1, G.F.S.C. Moneenageisha Road, Galway, Ireland. Email: info@mccarthykos.ie Tel: +353 (0)91 735611 Fax: +353 (0)91 771279

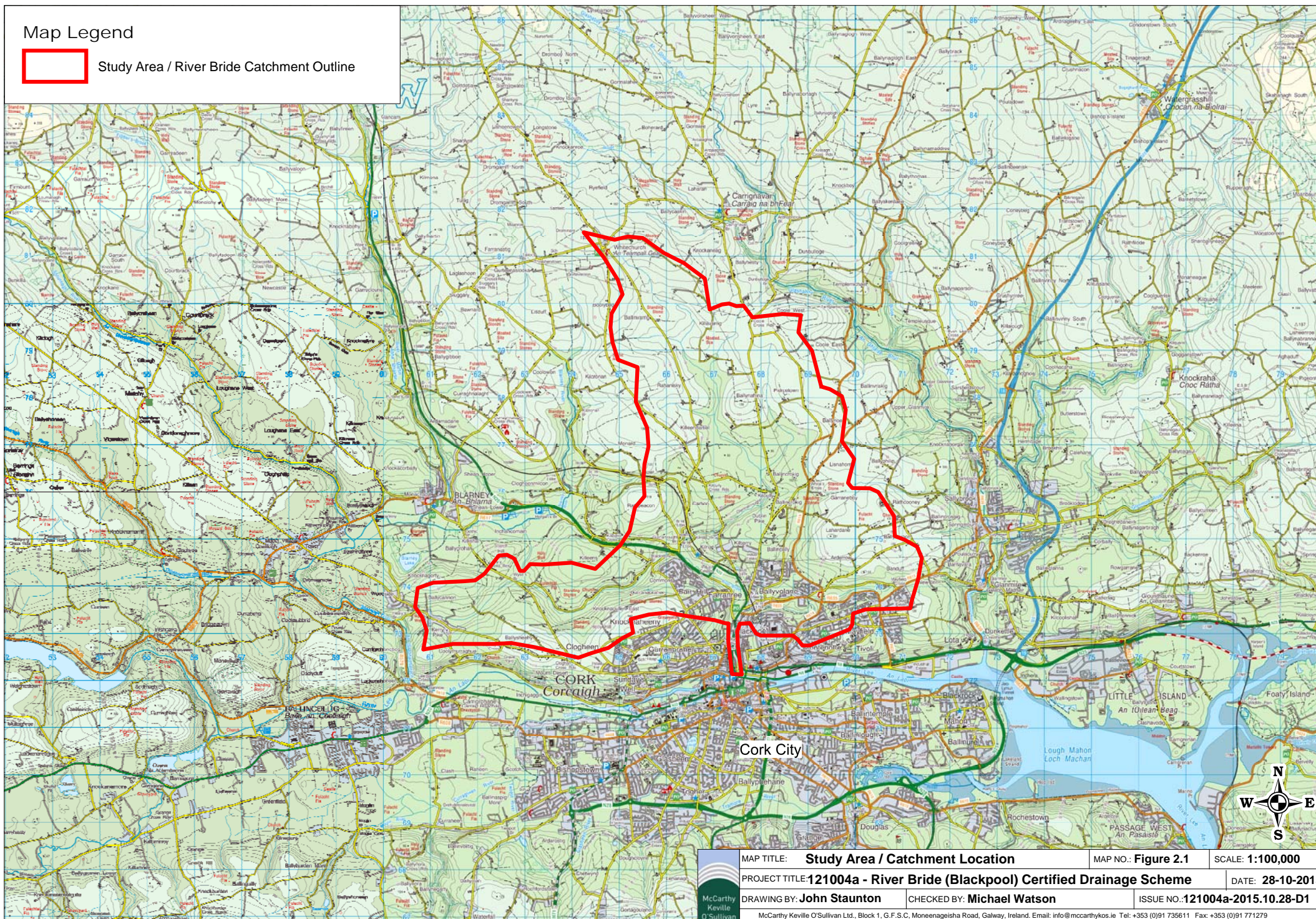
Ordnance Survey Ireland Licence No. AR 0021815 © Ordnance Survey Ireland/Government of Ireland



Map Legend



Study Area / River Bride Catchment Outline



	MAP TITLE: Study Area / Catchment Location	MAP NO: Figure 2.1	SCALE: 1:100,000
	PROJECT TITLE: 121004a - River Bride (Blackpool) Certified Drainage Scheme		DATE: 28-10-2015
	DRAWING BY: John Staunton	CHECKED BY: Michael Watson	ISSUE NO: 121004a-2015.10.28-D1
McCarthy Keville O'Sullivan McCarthy Keville O'Sullivan Ltd., Block 1, G.F.S.C. Moneenagish Road, Galway, Ireland. Email: info@mccarthys.ie Tel: +353 (0)91 735611 Fax: +353 (0)91 771279			

The greater catchment land-use comprises mainly intensive agriculture, with urban areas in the south and only a few small pockets of forestry.

There are no sites designated for nature conservation of national or European importance within the Study Area. The nearest site of national importance is the proposed Natural Heritage Area (pNHA) of Shournagh Valley, located approximately 300 metres to the west of the study area (Cork Lough is located approximately 2 kilometres south of the proposed works). The nearest site of international importance is Cork Harbour Special Protection Area (SPA), located approximately 1.1 kilometres to the southeast of the study area (approximately 4 kilometres east of the proposed works). Further details regarding the designated areas are provided in Chapter 5 of this EIS on Flora and Fauna.

The study area is entirely within the Bride (North) catchment and also includes the Glenamought and Glen tributaries.

2.2 NEED FOR THE PROPOSED DEVELOPMENT

There has been an extensive history of flooding in the Blackpool area of Cork City in recent years. Flooding is primarily due to heavy rainfall in the catchment of the Bride River and of its tributaries, the Glenamought and Glen Rivers. Prior to the early 2000s, the primary source of flood risk came from the Glen River, while after this time main source of flood risk has been the River Bride. Figure 2.4 below summarises the recent flood history and illustrates the flood risk of both watercourses. Figure 2.4 also shows the dates of culvert construction works as part of what was known as the Glen-Bride-Kiln (GBK) River Improvement Scheme. This work appears to have alleviated the flooding on the River Glen. Appendix 2A shows the existing flood extents in the Blackpool area.

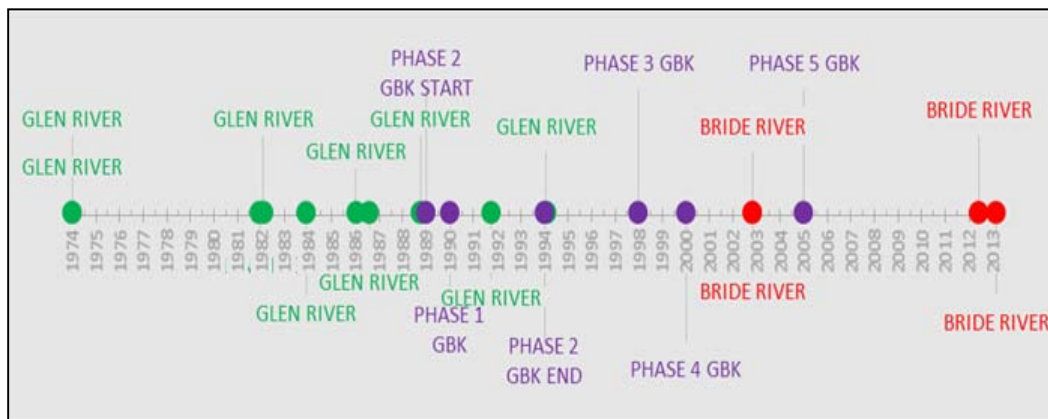


Figure 2.4 Timeline and source of recent flood events in Blackpool, showing River Improvement Scheme work phases

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

- Climate change resulting in higher rainfall
- Geomorphological processes, such as (i) Sedimentation transport, which affects the area of conveyance of the river channel and (ii) Erosion
- Development within the catchment of the Bride River, which does not conform with the principles of Sustainable Drainage, and which adversely affect the response of the catchment to rainfall
- Changes in land use, including forestation and land drainage

2.3 STRATEGIC PLANNING AND DEVELOPMENT CONTEXT

2.3.1 National Level

National Flood Policy

The Office of Public Works has the main responsibility for devising and implementing measures to deal with flooding. This responsibility is assigned by Government Decision S 28507 of 7 March 1995. In addition, the Arterial Drainage (Amendment) Act, 1995 enables the OPW to undertake local flood relief work schemes.

The National Flood Policy that was adopted by Government in 2004 identified OPW as the lead agency in coordinating the management of flood risk in the State. The Policy introduced a shift away from solely structural to non-structural measures to protect against flooding. The report prepared by the Flood Management Review Group decided that future Flood Management policy in Ireland would be:

"to minimise the national level of exposure to flood damages through the identification and management of existing, and particularly potential future, flood risks in an integrated, proactive and river basin based manner".

It encompasses a series of measures regarding sustainable flood prevention, protection and mitigation. An implementation plan of work programmes and associated resources that would be required to put the new policy into effect was developed by OPW.

In November 2007 the EU Floods Directive (Directive on the Assessment and Management of Flood Risks - 2007/60/EC) came into effect. The existing national Flood Policy described above is in line with the Directive.

2.3.2 Regional Level

Regional Planning Guidelines for the South West 2010 – 2022

The Regional Planning Guidelines (RPGs) for the South West Region 2010 – 2022 provide a framework for long-term strategic development in the South West Region, which comprises the administrative areas of Cork County Council, Cork City Council and Kerry County Council. The RPGs aim to ensure the successful implementation of the National Spatial Strategy at regional, county and local level. A key aspect of the RPGs is to maintain a balance between protecting and enhancing the environment and sustainable economic development of the South West Region. Flood protection is identified in Chapter 1 of the guidelines as a priority for the 2010 to 2022 period. Flood Risk Management is highlighted as an important issue for the region.

Cork City Development Plan 2015 - 2021

The Cork County Development Plan 2015 - 2021 sets out the overall strategy for the proper planning and sustainable development of the administrative area of Cork City Council. It recognises that rivers within the city are an important asset to the city with many functions including provision of habitats, public amenity, drainage and flood water storage. One of the strategic goals identified in the plan is to "Tackle climate change through reducing energy usage, reducing emissions, adapt to climate change and mitigate against flood risk". Open spaces within the city are noted as playing a large role in flood risk management. Chapter 12 of the Plan deals with the issues of Environmental Infrastructure and Management and also

contains a subsection on Flood Risk Management. One of the key needs in terms of surface water drainage identified in the plan is the construction of a major flood relief scheme on the Lower Lee, specifically on the River Bride in Blackpool and Ballyvolane. It is noted that the responsibility for these schemes rests with the Office of Public Works (OPW). The specific Objectives of the Cork City Council Planning Authority with regards to flooding include:

12.1 (i) Restrict landuse or require appropriate design as necessary to reduce risk of hazard, including those arising from flooding and controlled substances in industrial processes

12.13. Cork City Council shall have regard to the recommendations of the Draft Lee Catchment Flood Risk Assessment and Management Plan and shall incorporate the updated hydraulic modelling, mapping data and recommendations of South West CFRMP / Lee CRFMP (River Catchment Framework Management Plan) and the Lower Lee Flood Relief Scheme as each plan progresses.

12.14. Cork City Council will implement The Planning System and Flood Risk Management: Guidelines for Planning Authorities, 2009 in the preparation of land-use plans and determining planning applications.

12.15. To restrict development in identified flood risk areas, in particular, floodplains, except where the applicant satisfies the Justification Test as outlined in The Planning System and Flood Risk Management: Guidelines for Planning Authorities 2009.

12.16. To protect, enhance and manage the City's floodplains, wetlands and coastal habitat areas that are subject to flooding as vital 'green infrastructure' which provides space for storage and conveyance of floodwater, enabling flood risk to be more effectively managed and reduce the need to provide flood defence infrastructures.

12.17. All significant developments impacting on flood risk areas will be required to provide a Flood Impact Assessment to accompany the planning application to identify potential loss of floodplain storage and proposals for the storage or attenuation (e.g. SUDS) of run-off discharges (including foul drains) to ensure development does not increase the flood risk in the relevant catchment.

2.3.3 Local Level

North Blackpool Local Area Plan 2011

The North Blackpool Local Area Plan 2011 makes specific reference to flood risk. The plan states that the Draft Lee Catchment Flood Risk Assessment and Management Studies (CFRAMS) are at the core of new policies for flood risk management.

The plan notes that Cork City is "very vulnerable to adverse effects from small changes in sea level combined with changes in the occurrence of severe rainfall events and associated flooding of the River Lee and a number of smaller urban streams such as the River Bride". Appendix 2A ("*Proposed North Blackpool LAP Strategic Environmental Assessment (SEA) Screening Report*") of the Plan also notes that the North Blackpool Local Area Plan will not have a significant effect on flooding in the area.

2.4 SCHEME DESIGN PROCESS

The design process comprises a number of steps involving co-ordination of project engineering and environmental teams. The following steps have been completed in the design and assessment process:

- Constraints Study

- Hydrology Study
- Hydraulic Modelling
- Preliminary Site Investigation
- Flood Risk Assessments
- Selection of Preferred Option
- Appropriate Assessment Screening
- Cost Benefit Analyses
- Environmental Impact Assessment

The consultation and outcome of the above assessments are discussed below and within the various relevant EIS chapters in this document.

2.5 CONSTRAINTS STUDY

An environmental constraints study was completed at the outset of the project to identify the key environmental issues relating to the River Bride (Blackpool) Certified Drainage Scheme Study Area. These included features which had the potential to be impacted by the possible flood alleviation measures and/or impose constraints on the viability or the design of the measures proposed.

Environmental constraints were investigated under the following headings:

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

Desk studies on the status of the receiving environment under each heading were undertaken and a summary of the key constraints and implications of any proposed scheme was completed. In addition to the assessments undertaken, public consultation was undertaken and is outlined in more detail below. A summary of the key constraints identified for the Lower Lee Flood Relief Scheme (which included the River Bride (Blackpool) Certified Drainage Scheme) is summarised below. The full constraints document is available to access online at <http://www.lowerleefrs.ie>

Table 2.1 Summary of the key constraints identified for the Lower Lee Flood Relief Scheme (which included the River Bride (Blackpool) Certified Drainage Scheme)

Human Beings

In designing the proposed scheme, the value (both cultural and economic) of any buildings (Residential, Retail, etc) close to river edge or likely to be adversely affected by the scheme should be taken into account. In addition, adverse impacts on buildings or structures of conservation interest should be minimised or avoided where possible.

Any design proposals should ensure that Bridge links between east and west sides of Blackpool are maintained so that temporary or permanent disruption on local transport links in the City and on the major access routes for Cork are minimised.

The design of the scheme should consider the public amenity value of the study area. Impacts on public amenity areas adjacent to river such as the riverside walks should be considered, with replacement mitigation proposed if necessary. Similarly, specialist amenity areas including angling areas should be given consideration

Properties and businesses currently accessed by culverted sections or bridges over the Bride River will need to have access maintained/re-established where possible, if works on these areas are proposed.

Impacts on especially sensitive receptors e.g. schools, crèches, nursing homes, hospital should be considered in the flood risk assessment.

The proposed scheme should take consideration of the proposed zoning objectives set out in the Draft Local Area Plan.

Ecology

Given the sensitivity of the river habitat, factors that materially affect the function of the river under normal flow conditions such as water depth, velocity and changes to the shape of the bed should be given consideration, so that the existing function of the river can be maintained. Impacts to areas up and downstream of the Study Area should also be considered as part of the assessment.

In design of the proposed scheme, consultation with both the IFI and NPWS will be necessary, together with an appropriate amount of survey work (including electro-fishing) to establish baseline conditions in the river. Constraints may be placed on the times of year that in-stream works may be carried out depending on the results of the various surveys and the requirements of the IFI and NPWS. Constraints may also be placed on the time of year/weather conditions that the surveys may be undertaken.

In salmonid spawning areas (such as are located upstream of the study area), in-stream works are generally not permitted during the period October – March (inclusive), as this is the sensitive time for spawning. Given that the river is not an important angling or nursery area, it is unlikely that further constraints will need to be considered.

Pearl Mussel Surveys and Otter surveys can be undertaken at any time of year but are dependant on water levels. Pearl Mussel surveys require that there is good visibility in the water column and can only be undertaken in sunny, bright weather when water levels are not high and sediment loading on the river is low. Where such surveys are required, climatic conditions will constrain the timing of these.

Kingfisher surveys should be carried out during the summer nesting period (April – September)

It must be ensured that there are no significant impacts on Natura 2000 sites (SAC/SPA). Negative impacts on migrating fish have the potential to negatively affect the status of this designated site.

The woodlands, wetlands and riparian vegetation along the river corridor within the study area add greatly to the biodiversity. Damage to these riparian habitats should be minimised insofar as is practical so that the existing biodiversity in the area can be maintained.

Where possible works within the areas designated as pNHAs, the woodlands and areas with wetlands fringing the river should be minimised as these are likely to be the terrestrial areas of highest ecological sensitivity. The urban areas, arable and pastoral fields are likely to be the habitats of lesser ecological significance.

Appropriate measures should be taken to ensure that the spread of Japanese Knotweed and other invasive species is not accelerated by any proposed works.

Water

The design of the proposed scheme should take into account the water requirements (both Quality and Quantity) of any existing or future abstractions from the Bride and Lower Lee Rivers in Cork.

The design should also take into consideration the impact that any proposed flood relief scheme will have on the yields of existing groundwater abstractions from the Ground Water Body, taking into account the extreme and high vulnerability ratings of the local aquifer and presence of poorly productive bedrock aquifer's in the area.

The design of the proposed scheme should take into account the main objectives of the Water Framework Directive River Basin District Management Plan (RBDMP) by ensuring that any works proposed do not result in the deterioration of water quality.

The design should also take into account the presence of protected and sensitive areas identified in the RBDMP. Appendix 3 of the Plan lists the Protected Areas in the South Western RBD. The Lee is listed in Appendix 3 under the following headings: Lower Lee (Cork City) Flood Relief Scheme in association with Constraints Study Report

- Drinking Water Protected Area – River Waterbodies: Lee (River)
- Nutrient Sensitive Areas: Lee Estuary / Lough Mahon

Soils & Geology

It is recommended that a geotechnical investigation be carried out once the potential flood alleviation measures are developed in order to identify local geology and ground conditions.

Archaeology & Cultural Heritage

Given the provisions of the National Monuments Acts, no disturbance or interference to any archaeological sites listed in the RMP can take place without prior consultation with the National Monuments Service. In the event that any ground works are required in the immediate vicinity of any of these archaeological sites, it is recommended that appropriate mitigation measures be designed in consultation with the National Monuments Service.

All features listed in the RPS have statutory protection and, where feasible, avoidance of these features is recommended. Should works be required in the vicinity of protected structures then the formulation of site specific mitigation strategies in consultation with the Cork City and County Council heritage staff is recommended. It is also recommended that the same strategy be adopted for architectural heritage features listed in the NIAH. It is envisioned that the mitigation strategies will conform to those outlined in the various Development and Local Area Plans within the study area and that the EIS for the scheme will present the various objectives and other relevant information presented in the local authority plans.

There is also the potential for the presence of unrecorded archaeological sites and artefacts within the study area. Any green field areas that may be impacted by ground disturbance works required by the proposed scheme (e.g. flood defences, access tracks, compounds, site clearance works, trial-pits) may require archaeological investigations. Depending on the nature and extent of the works the mitigation measures may take the form of pre-construction test trenching or monitoring of ground works carried out during the scheme. The appropriate mitigation measures will be determined during the Design Phase in consultation with the NMS and local authority archaeological staff.

In the event that works are required within the channels and banks of the River Lee, and its tributaries, then there will be the potential for negative impacts on both recorded and unrecorded cultural heritage

riverine features, e.g. bridges, quays, weirs, fords, wrecks, fish-traps and landing/mooring features. It is recommended that the Underwater Archaeological Unit (NMS) should be consulted in order to agree the appropriate underwater archaeological assessment and mitigation strategies for proposed in-channel works. These may consist of licensed underwater archaeological surveys and archaeological monitoring of all sediment extraction works during the construction phase

Landscape

In the design of a proposed flood relief scheme, the following recommendations of the Cork County Development Plan should be taken into account in relation to Broad Fertile Lowland Valley Landscape Type, in which the majority of the Study Area is located:

Protect and preserve the River Lee and its surrounding floodplains as unique landscape features in this Landscape Character Type and as valuable resource for scenic and amenity values.

Conserve and enhance the characteristics in this Landscape Character Type that are important to tourism.

Have regard to the rich and diverse natural heritage in this Landscape Character Type and the areas that are designated for protection. While protecting these areas it is also important to recognise their potential as key recreation and amenity sources.

Protect the existing character and setting of Blackpool and adjacent areas which are under pressure from development and population growth as they are located close to Cork City centre.

The relevant recommendations for the City Harbour and Estuary Landscape Type, in which the eastern half of the Study Area is located and to which regard should be had in designing the proposed scheme, include:

Manage development that will adversely affect distinctive linear sections of the Lee River Valley, especially its open flood plains, when viewed from relevant scenic routes and settlements.

Improve public access to the River Lee by enhancing it as a key recreational and amenity source.

Recognise the potential constraints on development created by the River Lee flood plain and the value of this flood plain as an increasingly rare habitat.

In the design of a proposed flood relief scheme, the following recommendations of the Cork County Development Plan should be taken into account in relation to Broad Indented Estuarine Coast Landscape Type, in the eastern-most section of the Study Area:

Minimise disturbance of hedgerows in rural areas.

Encourage appropriate landscaping and screen planting of proposed developments by using predominately indigenous/local species and groupings,

Protect the existing character and setting of villages and village nuclei, which are under pressure from population growth.

Continue to promote agriculture as a major land use in this LCT. This will help maintain the existing features of the landscape while also supporting the local economy and rural diversification.

Appropriate design, siting and mitigation measures will be required to integrate the proposed scheme within the landscape. Particular regard should also be had to the potential visual impact on views available from the three stretches of designated Scenic Route and the areas of Scenic Landscape, which are located within the Study Area.

Air Quality

Prior to the selection of a preferred flood relief scheme as part of the Engineering Study, it is recommended that the short listed flood alleviation measures be assessed in relation to the impact of noise and vibration during the construction phase of the project.

It is recommended that mitigation measures be put in place to reduce the impacts on air quality and the noise environment during the construction phase of any proposed flood relief scheme.

It is recommended that the affects of vibration during the construction phase be considered in the selection process for potential flood alleviation measures.

Material Assets

It is recommended that the existing and proposed location of watermains and underground services in the vicinity of any proposed flood alleviation scheme be ascertained as part of the Engineering Study. It is recommended that Cork City and County Councils and other utility providers with services in the area be consulted regarding the location and priority of existing and proposed services. It is further recommended that the services be protected as part of any proposed flood relief scheme.

It is recommended that any proposed change in the hydrological regime of the River Lee and its tributaries be assessed in relation to the assimilative capacity of the river at the locations of all discharges from Wastewater Infrastructure within the Study Area.

2.6 CONSIDERATION OF ALTERNATIVES

2.6.1 Options Report

This section of the EIS contains a description of the alternatives that were considered for the proposed works, in terms of flood alleviation works design and location of the works.

Article 5 of the Environmental Impact Assessment (EIA) Directive (85/337/EEC) states that the information provided in an Environmental Impact Statement (EIS) should include an outline of the main alternatives studied by the developer and an indication of the main reasons for the final choice, taking into account the environmental effects. The consideration of alternatives typically refers to alternative sites, designs and processes.

The consideration of alternatives is an effective means of avoiding environmental impacts. The Environmental Protection Agency document 'Guidelines on the Information to be Contained in Environmental Impact Statements' (EPA, 2002) states that it is important to acknowledge however the existence of difficulties and limitations when considering alternatives. These include hierarchy, non-environmental factors and site-specific issues, as described below.

A copy of the Flood Risk Management Options Report is available to download on www.lowerleefrs.ie. There follows a summary of the information regarding alternatives considered as part of the options assessment.

The possible flood risk management (FRM) methods were initially screened to identify those that would be applicable and viable considering the risks to society, the environment, cultural heritage and the economy and the objectives of the flood risk management plan for the project. The potentially viable options were developed so that they could be evaluated in more detail. This involved hydraulic modeling of options where flood levels and extents had to be considered. The options were assessed against the flood risk management objectives with the use of local weightings. The preferred option was then identified following discussion with the OPW and steering group. The design standard to be adopted for the scheme,

as instructed by the steering group is the 1% AEP flood level with provision for adaptability to the Medium Range Future Scenario. The 1% AEP flood event has been used in this assessment of options.

2.6.2 Possible Flood Risk Management Methods

The possible flood risk management methods which could be utilized in a flood relief scheme include:

- a) Do Nothing (i.e., implement no new flood risk management measures and abandon any existing practices)
- b) Continue Existing Regime (i.e. Flood Early Warning System and Flood Emergency Response Plan)
- c) Do Minimum (i.e. implement additional minimal measures to reduce the flood risk in specific problem areas without introducing a comprehensive strategy)
- d) Non-Structural Measures
 - Implement Planning and development control measures
 - Enact building regulations relating to floor levels, flood-proofing, flood resilience, sustainable drainage systems, prevention of reconstruction or redevelopment in flood-risk areas, etc.
 - Enact regulations for sustainable urban drainage systems
 - Carry out targeted public awareness and preparedness campaign
 - Individual property flood resistance
 - Land use management, including creation of wetlands, riparian buffer zones, etc.
- e) Structural Measures (potential future risk where necessary floodplain development may occur)
- f) Structural Measures (existing risk)
 - Upstream flood water storage
 - Upstream restriction on river flows
 - Flow diversion
 - Increase conveyance
 - Construct flood defences (e.g. walls, embankments, demountable defences, etc)
 - Rehabilitate and improve existing defences including localised protection works (e.g. minor raising of existing defences/levels, infilling gaps in defences, etc.)
 - Relocation of properties
- g) Channel or flood defence maintenance works/programme

The criteria used for the screening of the various options included:

- Applicability to Area
- Social
- Environmental
- Cultural
- Economic

Flood Risk Management Option Assessment

A number of flood relief options (which are all discussed in detail in the Flood Risk Management Options Report) were developed before choosing the most preferred option. These were:

- Option 1 – ‘Do-Minimum’.
- Option 2 – Ballincrokig flood storage, combined with conveyance improvements and direct defences at Common’s Road/Blackpool
- Option 3 – Conveyance improvements and direct defences (with high walls in Orchard Court).
- Option 4 – Conveyance improvements and direct defences (with culvert through Orchard Court).
- Option 5 – Conveyance improvements & direct defences (culvert replacement from Orchard Court to Madden’s Building).

The ‘do-minimum’ option (Option 1) was ruled out, as the flood risk in the catchment would remain at similar levels to the existing case. This option was primarily used as a baseline to compare with the other options.

Option 2 (Ballincrokig flood storage, combined with conveyance improvements and direct defences at Common’s Road/Blackpool) appeared to be a strong option. It has the strongest cost-benefit ratio, and also gave similar results to the other options in the multicriteria analysis. It involved the construction of a flood reservoir upstream of Ballincrokig, combined with increasing the conveyance of the river and building direct flood defences in the Blackpool area. However, construction of a flood storage dam above Ballincrokig would create a new hazard (in the event of breaching or overtopping), and would result in the frequent flooding of valuable land in the area. Furthermore, the reservoir would only slow down water coming from upstream of that point, as there was a significant area downstream of it. It was considered more appropriate to manage locally through the risk area. This option will therefore be held as a reserve strategy for adapting to climate change if required in the future.

Increased river flow conveyance can be achieved by a number of means, including increasing the width of the channel over some or all of the channel, increasing the depth of the channel, removal of local constrictions and a combination of any of the aforementioned measures. The hydraulic computer model created for River Bride (Blackpool) Certified Drainage Scheme was used to simulate various options. Results are presented in the Flood Risk Management Options Assessment Report, available for download from www.lowerleefrs.ie.

The layout/arrangement of the works for option 3 (Conveyance improvements and direct defences (with high walls in Orchard Court) was considered optimal, and no major engineering drawbacks were identified. The works on Commons Road in this option consist of a mixture of conveyance improvements and direct defences. The Commons Road element of these works are consistent across all remaining option 3, 4 and 5. This option took into account the feedback received from Inland Fisheries Ireland, who expressed a strong desire to maintain the Bride in Orchard Court as an open channel. However, hydraulic modelling indicated that very high defence walls would be required to contain flood waters. Feedback from the public on this option demonstrated that this option would be publically unacceptable.

Option 4 (Conveyance improvements and direct defences (with culvert through Orchard Court)) was developed using the option 3 above as a basis. In Blackpool Village, in order to alleviate the local concerns, this option replaces the high walls in Orchard Court with a pressurised culvert. This option was marginally the most favourable in terms of MCA benefit/cost ratios, MCA Benefit Score and Option Selection Benefit Score. It also had the second strongest cost benefit ratio of the options assessed (after the storage option). When this option was reviewed holistically in the context of the other options, it was clear that this option had the least amount of drawbacks while still achieving the objectives of the project. In addition, there was no viable alternative to the culvert to address the concerns or the local community about the negative impacts of the high walls, whereas it is considered that there are opportunities further upstream in the catchment to compensate or mitigate any local loss of fish habitat in the short length of culverted section through Orchard Court. Such compensatory measures includes the de-culverting of a significant length of culvert through sunbeam as well as a commitment from OPW to provide appropriate funding to IFI for other compensation measures in the catchment to be agreed with IFI.

There are several factors which combined to rule out option 5 (Conveyance improvements & direct defences (culvert replacement from Orchard Court to Madden's Building)). These included technical challenges and difficulties due to existing infrastructure, considerable risk of property damage to Terraced housing on Watercourse Road, excessive costs and disruption to the local area during construction and significant risks of time and cost overruns. This option would also still require the construction of flood walls in Orchard Court.

Flood Risk Management Options Conclusions

The various options were appraised using a multi-criteria analysis (MCA) and Cost Benefit Analysis (CBA). The indicators, minimum requirements and aspirational targets, along with the global weightings and local weightings were agreed with the OPW for each objective to ensure consistency with the appraisal of options in other schemes nationally. It was found that the standard tools for options assessment (CBA and MCA) resulted in very small differences between the options and could therefore only be used as indicators on which to inform the use of professional judgement. The Cost Benefit Analysis shows that all options are cost-beneficial (excluding do-minimum). Therefore a decision on the preferred option was ultimately made by careful and holistic professional consideration of all of the various issues, resulting on Option 4 being chosen. Details of the proposed scheme are provided in Chapter 3 of this EIS.

2.7 SCOPING & CONSULTATION

Consultation in relation to the project has been completed on a number of occasions at various stages in the design process. These have included broad general consultation at the Constraints Study stage and an associated Public Information Event and Questionnaire. Subsequently, the emerging preferred option was presented to the public in another Information event in Blackpool and formal scoping as part of the Environmental Impact Assessment process was undertaken. The following sections outline the consultation completed to date.

2.7.1 Constraints Study Scoping

Scoping was carried out with numerous public and private bodies to identify any constraints for the proposed River Bride (Blackpool) Certified Drainage Scheme. The replies to this scoping can be found in Appendix 2B.

2.7.2 First Public Information Day

The first public information day was initiated with a presentation to the Members of the OPW, Cork City Council and Cork County Council on the 17th of July 2013. This event was carried out to include the larger Lower Lee (Cork City) Flood Relief Scheme, which included the River Bride (Blackpool) Certified Drainage Scheme. The purpose of this was to present the Study Area to the elected members, prior to the Public Information Event, and to outline the process involved in the preparation for the River Bride (Blackpool) Certified Drainage Scheme.

The presentation was held in Cork City Hall, between 3.00pm and 9.00pm. Members of staff from the Office of Public Works, Cork County Council, Cork City Council, Environmental Team (Ryan Hanley and McCarthy Keville O'Sullivan) and Design Team (Arup Consulting Engineers and JBA Consulting) were available to answer questions from the members of the Council.

2.7.3 Advertising of Public Consultation

Advertising of the Public Consultation Event was undertaken by the Environmental Team, in the local press in the week preceding the event. This included an advert in the local publications; Cork Independent, The Corkman, The Carrigdhoun, The Cork News and The Southern Star, in addition to adverts in two national daily newspapers; The Examiner and The Evening Echo. In addition, notices were placed on the local radio in the week and weekend preceding the event. The event was also well publicised locally through distribution information on local websites and through text alerts.

2.7.4 Literature Available for the Consultation

Brochures and Questionnaires were available at the exhibition on the 17th of July. Stamped addressed envelopes were provided to those who wished to return questionnaire by post. Information in addition to the questionnaires was also accepted on the evening of the event or subsequently by post.

A Constraints Study Public Consultation brochure was produced for the scheme, which showed the Study Area under consideration and provided a brief explanation as to the process involved and the options being considered. Brochures were freely available to the members of the public and interested parties, both during and after the exhibition. A copy of the brochure is attached in Appendix 2C.

A questionnaire with pre-printed questions was provided to each attendee, in association with the brochure. This provided an opportunity for members of the public to express their views on the Study Area shown and to provide information regarding flooding in their area, in addition to other comments they may have had relating to the design or the Environmental Constraints Study. A prepaid envelope was also provided for the return of the questionnaire. A copy of the blank questionnaire is attached in Appendix 2D.

2.7.5 Public Consultation Exhibition Posters

The format of the Constraints Study Consultation exhibition was based on a number of scheme posters. The posters included:

- Scheme Objectives and Overview
- Constraints Study
- Study Area Map – Archaeological & Ecological Sites
- Statutory Process

- Public Involvement

A copy of the exhibition posters are included in Appendix 2E.

2.7.6 Public Attendees and Response to Public Information Day

Members of the public visiting the exhibition were invited to sign a visitor's book to enable a record of the number of attendees to be maintained. A total of 44 attendees signed the attendance book at the event in Cork City Hall. While this turnout was relatively low, most of the attendees were from the Blackpool area.

Visitors to the exhibitions are considered to have in the main understood the proposals as presented at the exhibition. Comments received generally related to the level of flooding in the past, and most especially during the 2012 and 2013 events. Some members of the public brought photographs or maps of their property or demonstrated to project team staff the location of their property and their general concerns regarding the level of flooding and damage which arose from the events. In addition to provision of information about flooding, members of the public also provided information regarding previous maintenance of the river and their suggestions relating to potential flood alleviation measures.

Contact details were taken from members of the public who had additional information or had recorded flood levels, for the purposes of calibrating the hydraulic model. A total of 22 questionnaires were returned either at the exhibition or shortly thereafter by post. Submissions were made by a number of members of the public both at the public consultation event and by post or email following the event. The information generally provided related to flood levels, photographs of recent local flooding and articles regarding flooding history in Cork. This information was provided to the Design Team to assist in the production of the flood model when ascertaining the levels of flooding in previous events.

Overall feedback from members of the public was that they were happy to have been involved in the Public Consultation; they felt like their views were being heard, but wanted to see action arise out of the information as soon as possible.

2.7.7 Second Public Information Day

The second Public Information Day for the Lower Lee (Cork City) Flood Relief Scheme, which includes the River Bride (Blackpool) Certified Drainage Scheme, was held in Cork City Hall foyer in Bandon on Tuesday 29 July 2014. The purpose of this second Public Information Day was to provide information to the local community on the emerging preferred flood relief scheme which comprises a combination of dredging and defences.

The event was opened to the public from 3pm to 9pm. A total of 181 attendees signed the attendance book at the event in Cork City Hall. Approximately 54 people returned completed questionnaires (Appendix 2D). In advance of this event, a briefing was held for the City and County Councillors on Monday 28th July 2014 at 3.30pm.

At the Public Information Day on the 29th, posters (Appendix 2E) were displayed describing the process to date, the various options assessed, a preliminary impact assessment, summaries of surveys undertaken and drawings showing the emerging preferred flood relief scheme. Brochures were also available (Appendix 2C).

The majority of people that attended the Public Information Day reacted positively to the proposals presented on the day and felt that the proposals are appropriate for the area.

The following was noted in relation to people's verbal and written comments on the day:

- Several people commented that they were optimistic the issue of flooding would be dealt with based on the proposed works.
- Some concerns were raised in relation to diverting water into other channels, with concern that different areas could then flood. It was noted that the buildings on the north side quays have not flooded in living memory.
- A suggestion was made regarding re-opening an existing old masonry culvert for the bride, to divert some water
- The suggestion was made that dredging the existing channel would significantly reduce flooding without the need for embankments.
- Several people suggested that development be halted on green areas upstream of Blackpool.
- A number of people note that the release of water from hydro-electric dams needs to be more carefully planned
- It was suggested that a flood storage lake/dam be created upstream to prevent high water levels.
- Several people noted that current maintenance of river channels (dredging) was insufficient, and need to be increased.
- It was noted that having a flood wall along Orchard Court will encourage illegal dumping, and that an enclosed culvert would be more beneficial
- One person noted that high flood walls would encourage anti-social behaviour.
- The existing sharp turns in the river were noted by one person to have caused problems in the past as a result of creating turbulence in the water. It was also questioned if proposed walls were strong enough to cope with water forces.
- It was noted by one person that the proposed concrete flood walls are too high, and will look unsightly.
- Suggestions were made that good maintenance of trash screens and man hole covers will be essential to the avoiding future flooding
- It was suggested that further screening would be beneficial through Blackpool.
- A query was raised in relation to traffic implications and access to a local factory. It was noted that their work was busiest from January to August.
- It was suggested in one submission that glass be used for flood walls rather than concrete, for aesthetic purposes.
- A concern was raised as to whether the proposed works were conflicting with existing planning consents. It was suggested that the final design details will be discussed with landowners.

The comments and queries raised at the Public Information Day were considered in the scheme design and during the preparation of the Environmental Impact Statement.

2.7.8 EIA Scoping

Scoping is the process of determining the content, depth and extent of topics to be covered in the environmental information to be submitted to a competent authority for projects that are subject to an Environmental Impact Assessment (EIA). This process is conducted by contacting the relevant authorities and Non-Governmental Organisations (NGOs) with interest in the specific aspects of the environment likely to be affected by the proposal. These organisations are invited to submit comments on the scope of the EIA and Environmental Impact Statement (EIS) and the specific standards of information they require.

Comprehensive and timely scoping helps ensure that the EIA refers to all relevant aspects of the proposed development and its potential effects on the environment and provides initial feedback in the early stages of the project, when alterations are still easily incorporated into the design. In this way scoping not only informs the content and scope of the EIA, it also provides a feedback mechanism for the proposal design itself.

An EIA scoping report, providing details of the works footprint and emerging preferred flood relief option, was prepared by McCarthy Keville O'Sullivan Ltd. in association with Ryan Hanley and circulated on 30th September 2015. Comments of the relevant personnel/bodies in their respective capacities as consultees with regards to the EIA process were requested.

2.7.9 Scoping Responses

Consultees

Appendix 2F lists the consultees who were circulated copies of the EIA scoping document in September 2015. A copy of the EIA scoping document and cover letter is presented in Appendix 2G. Copies of all scoping responses received by 28th October 2015 are included in Appendix 2B of this EIS and a summary of the responses is outlined in Table 2.1 below. The recommendations of the consultees have informed the EIA process and the contents of the EIS.

Table 2.2 Consultee Scoping response summaries

Consultee	Summary of Response
Gas Networks Ireland	There are no gas transmission infrastructure in the vicinity of the proposed network. There is a gas distribution network in the area. A map was included to show the network.
Inland Fisheries Ireland	Requested further information on specific features of the development. Made comments on several aspects of the proposed works.
Transport Infrastructure Ireland (TII)	They are not in a position to comment on the proposed development. Best practice guidelines for drainage schemes were included.
Cork County Council	Acknowledged receipt of Scoping pack
Department of Jobs, Enterprise & Innovation	Acknowledged receipt of Scoping pack
Blackpool Flood Group/Blackpool Traders Association	The plan is fully supported by this group. Had several specific questions on the proposed works.

Chapter 3:

Description of Proposed Development

3 DESCRIPTION OF THE PROPOSED DEVELOPMENT

As described in Chapter 2, the Proposed Scheme for the River Bride (Blackpool) Certified Drainage Scheme comprises of a combination of flood walls, culverting a section of open channel, bridge replacement, embankment construction and other minor works. The Scheme will be designed to cater for the 1% Annual Exceedance Probability (AEP) flood event (also known as the 100 year flood event). The design of the proposed works is adaptable for future climate change in accordance with Office of Public Works guidance in relation to climate change and also includes an allowance for freeboard.

The proposed works are detailed on the scheme drawings included in Appendix 3A and are described generally in the following section. To undertake the proposed works on site, some access will be required to adjacent lands and the river channel, the extent of which can also be seen in Appendix 3A. The locations of each of the proposed works features are marked on the relevant drawing with a code, with the adjacent table providing a description for each code.

3.1 PROPOSED WORKS

The proposed works for the River Bride (Blackpool) Certified Drainage Scheme will comprise the following:

- Site investigation,
- Construction of new culverts,
- Replacement of existing bridges/ culverts,
- Construction of new flood walls/ earthen embankments,
- Constructing bridge parapets,
- Local channel widening of the River Bride (referred to as a 'Winter Channel' on the scheme drawings in Appendix 3A),
- Construction of a sedimentation trap on the left bank of the River Bride,
- Removal of approximately 100m of existing culvert and restoration of open channel (River Bride) at this location,
- Construction of a new trash screen and roughing screens, and removal of existing trash screens on the River Bride, and the Glen and Glenamought Rivers,
- Modifications to the existing foul and surface water collection networks in the vicinity of the proposed works, including construction of pumping stations, in order to prevent flooding,
- Removal of an existing sluice structure in the channel of the River Bride to the rear of the Dulux factory,
- Localised regrading of ground levels, erection of fencing and access gates, to facilitate pedestrian/ vehicular access to and around flood defences, or to redirect overland surface water flow paths,
- Filling in an existing open watercourse,
- Introduction of a flow control structure on the entrance to the Brewery culvert on the River Bride and the Spring Lane culverted branch of the River Glen, and
- Regular maintenance of the river channel and pumping stations.

3.1.1 Site Investigation

A detailed site investigation will take place in advance of the construction works to inform the detailed design of the drainage scheme. Trial pits, slit trenches, boreholes, rotary core boreholes and dynamic probes will be carried out along the footprint of the proposed works, in addition to utility identification.

3.1.2 Culverts

The scheme will include construction of new culverts at the following locations:

- 342m of new reinforced concrete culvert (approximate internal dimensions 5.5m x 2.1m) commencing downstream of the Blackpool bypass (N20 Commons Road) at Orchard Court and terminating under the Old Commons Road to the North of Blackpool Church.
- Replacement and slight realignment of 7m of existing culvert (approximate internal dimensions 5.5m x 2.1m) on Old Commons Road upstream of Blackpool Church.
- Rehabilitation of 26m of existing culvert on Old Commons Road upstream of Blackpool Church and 163m of existing culvert on Watercourse Road upstream of Madden's Buildings.
- Replacement and slight realignment of 69m of existing culvert at Blackpool Church commencing on Old Commons Road and terminating on Watercourse Road. This will also involve culverting a open section of channel outside the Church.
- Replacement and slight realignment of 62m of existing culvert at Madden's Buildings commencing on Watercourse Road and terminating on the North City Link Road (N20). This will involve construction of a flow control structure at the entrance to the 'Brewery' culvert, which runs under Watercourse Road.

The culverts will consist of reinforced concrete structures and in general will be constructed on the footprint of the existing river channel (within only minor realignment). The one exception will be the culvert at the northern end of Orchard Court, which will be constructed off the line of the existing channel. This is required in order improve the efficiency of the culvert system and thereby increase the capacity of the river channel.

A concrete blockwork boundary wall will be constructed along the property boundaries on the right bank of the new Orchard Court culvert.

3.1.3 Bridge Replacement

The scheme will include replacement of existing bridges/ culverts at the following locations:

- Two existing bridges/ culverts on the Glenamought River will be replaced with new reinforced concrete bridges between Sweeney's Hill and the North Point Business Park.
- Two existing bridges/ culverts on the River Bride will be replaced with new reinforced concrete bridges between the North Point Business Park and Commons Road (N20).
- Two pedestrian bridges at Blackpool Retail Park will be removed and replaced by a new crossing point approximately 120m and 10m to the North of the two bridges respectively.

The purpose of the replacement is to increase the conveyance capacity of the River Bride at the first two locations, and to facilitate construction of flood defences at Blackpool Retail Park in the case of the two

pedestrian bridges. It will also be necessary to limit vehicular and pedestrian access points across the river during construction stage to facilitate the construction of the new bridges and culverts. These access points will be fully restored on completion of the works, the bridge effectively being replaced by the new culvert.

In addition, the construction of the culvert will result in the removal of two existing bridges at Orchard Court, including one pedestrian bridge.

3.1.4 Flood Walls/ embankments

The scheme will include construction of new flood walls/ earthen embankments at the following locations:

- 137m of earthen embankment at Woodview (Glenamought River), downstream of the railway viaduct on the Cork-Limerick railway line,
- 122m of flood wall adjacent to the Lower Killeens Road (River Bride),
- 31m of flood wall and 105m of earthen embankment to the North and West of the Commons Inn Hotel,
- 74m of flood wall on the right bank of the Fairhill Stream to the rear of Bride Villas,
- 244m of flood wall on the right bank of the River Bride between the Bride Villas and the 'Topaz' filling station,
- 244m of flood wall on the right bank of the River Bride between the Dulux factory and the Sunbeam Industrial Estate (raising existing wall),
- 387m of flood wall on the right bank of the River Bride between the Dulux factory and the Sunbeam Industrial Estate (raising existing wall),
- 330m of flood wall on the left bank of the River Bride between the Dulux factory and the Sunbeam Industrial Estate (raising existing wall),
- 223m of flood wall on the left bank of the River Bride between the Dulux factory and the Sunbeam Industrial Estate (new wall),
- 139m of flood wall on the right bank of the River Bride between the Dulux factory and the Sunbeam Industrial Estate (new wall),
- 115m of earthen embankment along the left bank of the River Bride at the location of a new crossing point and trash screen,
- 212m of flood wall on the left bank of the River Bride alongside to the Blackpool Retail Park/ Heron Gate and River House, and
- 45m of flood wall on the left bank of the River Bride between the Commons Road (N20) and the carpark of the Blackpool Shopping Centre.

Table 3.1 Flood defence heights

Location of Defence	Flood Defence Type	Height of Defence (m)
Woodview (Glenamought River), downstream of the railway viaduct on the Cork-Limerick railway line.	137m of earthen embankment.	1.1m above existing ground levels (typically)

Location of Defence	Flood Defence Type	Height of Defence (m)
"Rose Cottage" [adjacent to the Lower Killeens Road (River Bride)].	122m of flood wall.	1.7m above existing ground levels (typically)
North and West of the Commons Inn Hotel.	31m of flood wall.	0.45m above existing ground levels
North and West of the Commons Inn Hotel.	105m of earthen embankment.	0.8m above existing ground levels (typically)
Bride Villas (Fairhill Stream)	74m of flood wall	1.2m above existing ground levels (typically)
Right bank of the River Bride between Bride Villas and the 'Topaz' filling station	244m of flood wall	0.8 / 1.34m above existing ground levels (varies)
Right bank of the River Bride between the Dulux factory and the Sunbeam Industrial Estate (raising existing wall)	387m of flood wall	0.35 / 0.68m above existing ground levels (varies)
Left bank of the River Bride between the Dulux factory and the Sunbeam Industrial Estate (raising existing wall)	330m of flood wall	Height varies significantly along the length (up to 1.27m above existing ground level). Refer to Appendix 3A for heights of individual sections.
Right bank of the River Bride between the Dulux factory and the Sunbeam Industrial Estate (new wall)	139m of flood wall	0.93m above existing ground levels (typically)
Left bank of the River Bride between the Dulux factory and the Sunbeam Industrial Estate (new wall)	223m of flood wall	0.5 / 0.88m above existing ground levels (varies)
Blackpool Retail Park, along the left river bank at the location of a proposed trash screen.	115m of earthen embankment.	1.15m above existing ground levels (typically)
On the left bank of the River Bride alongside to the Blackpool Retail Park/ Heron Gate and River House.	212m of flood wall.	Height varies significantly along the length (up to 1.2m above existing ground level). Refer to Appendix 3A for heights of individual sections.
On the left bank of the River Bride between the Commons Road (N20) and the carpark of the Blackpool Shopping Centre.	Repair and/or reconstruct existing river wall to flood defence level (45m)	1.53m above existing ground levels (varies)

The purpose of the flood walls and embankments is to prevent overtopping of the river banks and to subsequent flooding that would result from overtopping. The locations and heights of flood walls and embankments have been chosen based on a hydrological and hydraulic analysis of the River Bride, topographical data, the 1% Annual Exceedance Probability (AEP) flood event (also known as the 100 year flood event), and allowance for freeboard.

Where space is available, flood defences will consist of earthen embankments. In most cases, space constraints in the vicinity of the urbanised catchment of the River Bride in the vicinity of Blackpool means that flood walls will be required. In some locations, such as to the rear of the Dulux Paints factory, the new flood walls will replace existing walls or will consist of extensions to existing reinforced concrete retaining walls.

3.1.5 Bridge Parapets

It will be necessary to carry out works to bridge/ culvert parapets at the locations shown on the Scheme Drawings contained in Appendix 3A in order to contain flood waters within the river channel. The existing bridges/ culverts in question are located between the North Point Business Park and Commons Road (N20) as shown on the Scheme Drawings in Appendix 3A. Works will consist of repairs to existing parapets where they exist, replacement of existing parapets where repairs are not practical or cannot deliver the required level of protection, construction of new parapets where existing parapets do not exist, or where existing parapets are not of a sufficient height to contain flood waters.

3.1.6 Winter Channel

A series of sharp bends in the Bride channel contribute to elevated flood levels along the Commons Road (N20). This is because the water velocity is abruptly slowed at each of these bends. It is proposed to introduce a 'winter channel' to the existing channel to help with high flows by cutting a secondary flow route into the existing bank. In normal flow conditions, the river would be confined to the 'low-flow' or 'summer channel', however during periods of high flow the winter channel would provide additional capacity.

The winter channel will consist of an excavation of the right bank (looking downstream). The left bank will be undisturbed. The width of the cut will vary from 0m at the upstream/downstream ends, to maximum 7-10m at the apex of the river bend. The formation level of the cut will be at approximately 1.2m above the channel invert (approx. 18.7mOD). This will leave the existing low flow channel substantially undisturbed apart from cutting back vegetation. The total length of the cutting will be approximately 50m on plan, measured along the bank line.

The slope of the new cutting will match the existing bank slope. The surface of the new cut slope will be covered with a biodegradable membrane, which will protect the exposed soil from erosion while vegetation is re-established over a number of months following the works.

3.1.7 Sedimentation Management

It is proposed to construct a sediment trap at the upstream end of the Sunbeam Industrial Estate.

The purpose of the sediment trap at the Sunbeam Industrial Estate is to capture fluvial sediments (primarily small cobble sized material), to help minimise the risk of large sediments settling in the Blackpool culvert system, which would reduce hydraulic capacity. A sediment trap is an online pond which increases local width and depth of the channel and reduces flow velocity. This promotes the settlement of suspended

solids, and the deposition of coarser bedload. Sediment traps require regular maintenance to remove sediment and will no longer function when full.

On this basis, the sediment trap would be sized within the region of approximately 25m wide x 63m long. It will most likely be constructed of reinforced concrete or sheet pile walls with shallow rock weirs constructed at 20m centres. It will be constructed by excavating an area of the existing channel to make it wider and deeper. The inlet and outlet structures will have the same invert level and approximate dimensions as the existing channel in those locations, to minimise impact on upstream and downstream water levels. The bed level of the basin will be approximately 1.5m below the existing bed level.

The sediment trap will also incorporate a ramp along the left bank to allow access for a JCB/excavator to remove accumulated sediment and will also require a slight realignment of the river channel at the downstream end of the sedimentation trap. It will also be necessary to slightly realign local access routes to the north of the sediment trap.

A second potential sedimentation area has been identified upstream of the Commons Inn hotel and this has provisionally been identified on the scheme drawings, if following detailed design or operation of the primary sediment trap, it becomes apparent that the addition of this area would provide an overall benefit to the management of sediment within this reach.

This trap would be located upstream of the Commons Inn Hotel and its purpose will be to naturalise and reconnect the floodplain at this location. Flood scalping and lowering of the inside channel bends along a gently meandering section of river channel have the potential to enhance natural sediment controls upstream of the sediment trap at Sunbeam. In addition to regrading ground levels, this sediment management feature may incorporate instream geomorphic features, such as riffles. The potential inclusion of this feature in the scheme will be subject to review following detailed geotechnical investigations, detailed design and at a later point during the scheme operation.

3.1.8 Open Channel

The scheme will include removal of approximately 100m of existing culvert to the rear of the Sunbeam Industrial Estate, and restoration of open channel (River Bride) at this location. This work will be done in combination with construction of a sedimentation trap, a new pumping station, regrading of ground levels and construction of flood walls at the same location (described separately in this chapter).

3.1.9 Screens

The scheme will include construction of a new trash screen within the channel of the River Bride at the Blackpool Retail Park and three new roughing screens upstream of the Viaduct on the Glenamought River, upstream of Rose Cottage on the River Bride (North) and upstream of the existing Spring Lane trash Screen on the River Glen. The existing trash screens on the River Bride (North) (two existing screens) and the River Glen at Spring Lane will then be removed. The purpose of the roughing screens and trash screen will be to remove large debris from the river channel, which could potentially cause a blockage in the almost entirely culverted channel downstream of this Blackpool Retail Park.

Trash screens will be designed in accordance with the UK Environment Agency "Trash and Security Screen Guide 2009" and CIRIA guidance document C689 "Culvert Design and Operation Guide". The EA guidance states that only mature salmon species could be discouraged by a screen. Other fish species are unlikely to be affected by bars with a minimum clear spacing of 250 mm. For the Blackpool screen, the minimum bar spacing will be no less than 150mm in accordance with the CIRIA guidance document.

The roughing screens will be designed to catch only large debris and allow smaller material to pass through. The screens will be designed to allow for overtopping and/or bypassing during high flood levels or blockage scenarios without the risk of flooding nearby properties. The overall screen width will be approximately 20m on the Glenamought River and approximately 10-15m on the River Bride.

3.1.10 Drainage Works

Flooding in Blackpool is primarily fluvial (i.e. flood waters flow directly from the River Bride, however restricting the river channel by constructing hard flood defences will also restrict pluvial flow - surface water run off during rainfall events which coincides with high river levels. There are existing surface water and combined foul and surface water collection networks in Blackpool.

In order to prevent pluvial flooding, particularly during flood events, it will be necessary to modify the surface water and combined drainage network in the town. Initially, existing outfalls will need to be sealed against backflow from rising flood waters, where this has not already taken place.

Pumping stations will be required so that surface water run off can be pumped to the river channel during flood events and on occasions when the new non-return valves malfunction. In addition to substructure, pumping stations will incorporate a surface mounted kiosk in close proximity to the underground substructure. Seven pumping stations are proposed at the following locations:

- Bride Villas (Commons Road),
- Fitz's Boreen,
- Two pumping stations to the rear of the Dulux factory, one on either bank of the River Bride,
- Open area at North end of Orchard Court,
- Old Commons Road (at entrance to Orchard Court), and
- Blackpool Church/ Thomas Davis Street.

New collector drains will be required to connect the new and old collection networks. Surface water will be pumped into the river channel/ new culvert at these locations through new rising mains fitted with non-return valves.

In addition to the above, it will be necessary to regrade impermeable areas (roads, footpaths) at certain locations along the route of the River Bride, in order to redirect overland flow towards the river or other surface water drainage networks. The extent of regrading works required is shown on the Scheme Drawings in Appendix 3A.

3.1.11 Maintenance Regime

A rigorous and organised channel maintenance programme will be required throughout the reach of the channel impacted by the proposed works. The channel maintenance programme will include the following stretches of river/ stream channel:

- The Glenamought River from the new roughing screen upstream of the Viaduct to its confluence with the River Bride (517m),
- The River Bride from the new roughing screen upstream of Rose Cottage to Blackpool Church (2,623m),

- The River Bride (Kiln culvert branch) from Blackpool Church to the confluence of the Kiln Branch and the Kiln Brewery Branch (946m, running under Watercourse Road and the N20 Blackpool Bypass),
- The River Bride (Kiln Brewery culvert branch) between its bifurcation with the Kiln culvert branch at its upstream end to its confluence with the Kiln culvert branch at its downstream end (740m, running under Watercourse Road and the Heineken Brewery),
- The Glen River (Spring Lane culvert branch) from its confluence with the new culvert on the River Bride to the proposed sluice structure at the head of this channel section (333m),
- The Glen River (mainly open channel) from the proposed sluice structure referred to above to the existing culvert under the North Ring Road (230m),
- The Glen River (Back Watercourse culvert branch) from the proposed sluice structure referred to above to its confluence with the (Kiln Watercourse culvert branch) outside Madden's Buildings (542m, running mainly under the N20 Blackpool Bypass),
- The Rathpeacon Stream from its confluence with the River Bride for a distance of 193m upstream, and
- The Fairhill Stream from its confluence with the River Bride for a distance of 108m upstream,

The channel maintenance programme will pay particular attention to locations where silt, gravel and debris are likely to accumulate, such as at structures, sharp bends, culvert inlets, etc.

The new trash screen and roughing screens will require regular maintenance, as will the proposed surface water pumping stations. The surface water pumping stations will require regular maintenance and it will be necessary to jet the surface water sewers to maintain hydraulic capacity to drain flood waters.

Other measures will include regular inspections of flood walls and embankments, regular scheduled maintenance of the river channel and pruning of trees (including removal of tress where necessary), planning and control measures. The inspection regime will ensure that there is no deterioration in the structural integrity of the defences which may occur as a result of a collision for example. It is expected that the flood defences will be relatively maintenance free otherwise. The extents of channels/culverts to be maintained will be shown on the drawings contained in Appendix 3A. In general, maintenance activities will consist of the following:

- The channels and structures will be monitored by means of a walkover survey from the banks on a regular basis (likely quarterly, and also following a flood event). The walkover surveys would aim to identify issues with implications for flood risk (e.g. fallen trees, excessive vegetation build-up, overgrown trees, illegal dumping, accumulation of granular deposits, etc.). In-channel debris will typically be removed by JCB. Excessive overhanging vegetation will typically be pruned back or removed by hand using a cherrypicker, depending on access.
- Culverts will be inspected by means of man-entry on an annual basis, or following a significant flood event. Any debris present in the culvert will be cleared by hand. A full CCTV survey and clearing of silt/sediment from the culvert is expected to take place approximately every five years. Removal of debris will be carried out as required.
- The optimum frequency of cleaning of the sediment trap and trash screen will evolve over time based on experience. However, initially it is proposed to carry out cleaning generally on a

quarterly basis, and also following a significant flood event. Water level monitoring and alarms will also be installed at the trash screen to alert maintenance staff of a screen blockage.

3.2 ANTICIPATED CONSTRUCTION METHODS

3.2.1 New Culvert

Construction of new culverts will form the most significant aspect of the new scheme. Approximately 480m of new culvert will be constructed in Blackpool, some of which will be constructed along the route of the River Bride. Construction of the new culvert will take place as follows:

- The works area will be isolated and traffic management set up as required. Temporary road closures will be required for the culvert replacement in the vicinity of Blackpool Church and Madden's Buildings. Alternative access routes may be required for Orchard Court during construction works if it does not prove possible to maintain one lane of the existing bridge open at all times/ maintain access in the vicinity of the existing bridge.
- Temporary works will be put in place, including silt barrages, and flow diversions/ over pumping where in stream works are required at Blackpool Church and between the Old Commons Road and the N20 culvert (upstream of Orchard Court). Service diversions will also be required in advance of culvert construction, particularly at Blackpool Church and Madden's Buildings.
- The foundations will be excavated down to formation level. Utilities and drainage pipes will be diverted as required. Excavated material will be transported off site to a licenced facility or stored for reuse on site. Blinding will be poured.
- Reinforced concrete culverts will be placed in position. Utilities and drainage pipes will be diverted into permanent positions as required.
- The excavation will be backfilled, the area reinstated, and the works area reopened. In the case of culverts constructed under the public road, permanent reinstatement may be required approximately six months following reopening of the road.

3.2.2 Bridge Replacement

The replacement of existing bridges is likely to comprise the following proposed works:

- The works area will be isolated and traffic management set up as required. Temporary road closures may be required if it does not prove possible to maintain one lane of the existing bridge open at all times/ maintain access in the vicinity of the existing bridge, or if an alternative convenient access route is available.
- Temporary works will be put in place, including silt barrages, and flow diversions/ over pumping. Service diversions may also be required in advance of culvert construction.
- The existing bridge/ culvert structure will be dismantled/ demolished and removed off site.
- The foundations will be excavated down to formation level. Excavated material will be transported off site to a licenced facility or stored for reuse on site. Blinding will be poured.
- The new bridge/ culvert will be constructed using either precast units or reinforced concrete placed in situ. Utilities and drainage pipes will be diverted into permanent positions as required during/ following construction. Construction of an in-situ reinforced concrete bridge would involve

- Fixing of reinforcement for abutments and piers,
 - Placing of formwork for abutments and piers,
 - Placing of cast in-situ concrete for abutments and piers,
 - Stripping of formwork,
 - The placing and fixing of a precast concrete bridge deck, and
 - Construction of bridge parapets.
- The excavation will be backfilled, the area reinstated, and the works area reopened. Permanent reinstatement of road surfaces may be required approximately six months following reopening of the road.

3.2.3 Bridge Parapets

New/ upgraded bridge parapets will be constructed as follows:

- Isolation of works area, including traffic management.
- One lane of the bridge will be closed at a time where possible. Where sufficient space is not available to accommodate a working area and live traffic, a road closure will be acquired and alternative access put in place.
- The existing bridge parapet/ railings will be removed where these exist.
- The underlying concrete will be scabbled and starter bars dowelled into the concrete.
- Formwork will be set up from the bridge deck for the construction of the reinforced concrete bridge parapet.
- Scaffolding will be set up as required. The parapet will be poured following steel fixing. Once the concrete has cured, the formwork will be stripped and the scaffolding removed.
- The lane will be opened, the second lane closed and the plant and equipment will be relocated to the location of the second parapet.

3.2.4 Flood Defence Walls

The construction of the reinforced concrete flood defence walls is likely to be carried out by traditional methods comprising the following activities:

- isolation of works area, including traffic management where the work area will overlap with a public road/ pedestrianised area,
- temporary works including silt barrages where in stream works are required,
- excavation for foundations,
- blinding of formation,
- fixing of reinforcement,
- placing of formwork,
- placing of concrete,

- stripping of formwork, and
- reinstatement of works area.

In certain locations, where there is a possibility of flood water passing underneath the flood defence wall foundations, either sheet piles or grouting techniques will be required to provide a cut-off. The sheet piles may be metal or plastic and will be driven to the required depth using a piling hammer or similar.

3.2.5 Earthen Embankments

The construction of the earthen flood defence embankments is likely to comprise the following activities:

- Temporary works,
- Excavation for formation,
- Placing and compaction of suitable clay material, and
- Reinstatement of area, including grass seeding.

3.2.6 Drainage Works

The drains/ surface water sewers will be constructed by one of two methods as follows:

- Where the trench does not overlap with the footprint of the excavation for the flood wall, the trench of the drainage pipe will be set out. Where the trench is located in a road, the road will be saw cut. Where the trench is located in a grassed area, the topsoil will be removed and stored in close proximity to the trench. The trench will then be excavated to the required depth. Excavated material unsuitable for use as backfill material will be disposed of to an approved waste management facility. Pipe bedding will be placed, followed by the pipe and granular pipe surround. Trenches in roads will be backfilled with granular material or lean mix concrete, depending on its location in accordance with the Guidelines for Managing Openings in Public Roads. Trenches in grassed areas will be backfilled with suitable excavated material, following which the original topsoil will be replaced. The trench will be left to consolidate for approximately six months, following which the surface layer will be removed is necessary, the backfill material will be supplemented and the trench reinstated.
- Where the trench overlaps with the footprint of the excavation for the flood wall, the steps outlined above will be taken. The order of excavation, pipelaying, backfilling and reinstatement will depend on the sequence of construction of the retaining wall and the proximity of the proposed retaining wall to the pipe trench. The pipe may be laid and partially backfilling prior to pouring of concrete for the wall. Pipelaying may alternatively take place following pouring of the base of the wall or following construction of the wall.

3.2.7 Pumping Stations

The footprint of the pumping station will be set out. Where the proposed excavation is located in a paved area, the pavement will be saw cut. Where the proposed excavation is located in a grassed area, the topsoil will be removed and stored in close proximity to the excavation. The excavation will take place to the required depth. Sheet piling will likely be required in order to facilitate construction of deep excavations in an urban area. Excavated material unsuitable for use as backfill material will be disposed of to an approved waste management facility. Lean mix concrete blinding will be placed, followed by

formwork and steel fixing. Once concrete has been poured and has cured, the formwork will be stripped and the area outside the pumping station will be backfilled. Excavations in grassed areas will be backfilled with suitable excavated material, following which the original topsoil will be replaced. Excavations in paved areas will be backfilled with granular material and reinstated to their original condition. Mechanical and electrical fit out of pumping stations will take place following backfilling.

3.2.8 Other Instream Works

Other proposed works which would be carried out partially or wholly instream include:

- Local channel widening of the River Bride (referred to as a 'Winter Channel' on the scheme drawings in Appendix 3A),
- Construction of a sedimentation trap on the left bank of the River Bride,
- Construction of roughing screens and a new trash screen,
- Removal of existing trash screens on the River Bride (North) and Glen River, and
- Removal of an existing sluice structure in the channel of the River Bride to the rear of the Dulux factory,

In general, these works will involve:

- Isolation of works area, and temporary works including silt barrages, flow diversions or over-pumping,
- Dismantling/ demolition and removal of the existing structure (in the case of sluice structure at Dulux and the screens on the River Glen and Bride North) and removal off site,
- Excavations,
- Blinding of formation (as required),
- Construction of sedimentation trap/ screen, following which
- The excavation will be backfilled, the area reinstated, flow redirected, and the works area reopened.

3.3 CONSTRUCTION PROGRAMME AND SEQUENCING OF PROPOSED WORKS

The construction works will be preceded by geotechnical investigations, which will consist of a mixture of shell and augur boreholes, cable percussive boreholes, rotary drilled boreholes, trial pits and slit trenches at the locations of the proposed structures. The construction works themselves will last approximately eighteen months and will be subject to the following programme constraints:

- Instream works (include preparatory work) on all watercourses supporting salmonids shall be undertaken from May to October (inclusive) and in consultation with Inland Fisheries Ireland to avoid accidental damage or siltation of spawning beds.
- To avoid impacting on bird nesting sites, the vegetation removal within the defined working area will not be carried out during the peak bird nesting season of March to August (inclusive) prior to the onset of works.

- Christmas non-working time is from the beginning of the second week of December to the end of the second week of January.

3.4 TEMPORARY CONSTRUCTION WORKS FACILITIES

The site compound will be located on a brownfield site in the immediate vicinity of the works. The selection of the compound will be by the Contractor appointed to construct the works in consultation with the Office of Public Works and the project ecologist. Due to the length of channel involved, it the Contractor may choose to move the compound during the construction period, in which case the same selection process shall apply. Site compounds will be bound by the mitigation measures identified within this EIS.

3.5 ESTIMATED COST OF PROPOSED WORKS

The estimated cost of the River Bride (Blackpool) Certified Drainage Scheme is € 8.5M, excluding VAT, and Non Contract Costs. The total project budget is currently estimated at € 14M, excluding VAT.

Chapter 4:

Human Beings

4. HUMAN BEINGS

4.1 Introduction

This section of the Environmental Impact Statement (EIS) describes the potential impacts of the proposed development on human beings and has been completed in accordance with the guidance set out by the Environmental Protection Agency in 'Guidelines on Information to be contained in Environmental Impact Statements' (EPA, 2000).

One of the principle concerns in the development process is that people, as individuals or communities, should experience no diminution in their quality of life from the direct or indirect impacts arising from the construction and operation of a development. Ultimately, all the impacts of a development impinge on human beings, directly and indirectly, positively and negatively. The key issues examined in this section of the EIS include population, employment and economic activity, land-use, residential amenity, community facilities and services, tourism, and health and safety.

Reference is also made, in this chapter, to nuisance impacts on human beings that are dealt with in other sections of this EIS such as flooding from Chapter 7 - Hydrology and Hydrogeology; dust and noise from Chapter 8 - Air and Climate; and traffic from Chapter 11 - Material Assets.

4.2 Receiving Environment

4.2.1 Methodology

The following sources of information and literature pertinent to the area were used in the preparation of this section:

- Central Statistics Office (CSO),
- Cork City Development Plan 2015 – 2021,
- North Blackpool Local Area Plan 2011 – 2019,
- Farranferris Local Area Plan 2009,
- Fáilte Ireland
- Local club websites

The study included an examination of the population and employment characteristics of the area. This information was sourced from the most recent census, the Census of Ireland 2011, the Census of Agriculture 2010 and from the CSO website, www.cso.ie. Census information is divided into State, Provincial, County, Major Town and District Electoral Division (DED) level.

4.3 Human Beings in the Existing Environment

4.3.1 Study Area

Definition of Study Area

The Study Area for the purpose of the Environmental Impact Assessment (EIA) of the proposed Drainage Scheme consists of the entire catchment of the River Bride (and tributaries) upstream of Blackpool, as shown in Figure 1.1. However, in order to make inferences about the population and other statistics in the vicinity of the proposed development site, the Study Area for the Human Beings section of the EIA was defined in terms of the relevant District Electoral Divisions (DEDs). The Study Area for the EIS lies within several DEDs, as shown in Figure 4.1. It has been decided to define the Study Area for the Human Beings Section of this EIS as all those DEDs in which the EIS Study Area is located. The site of the proposed development lies within the Commons, Fair Hill C, Farranferris A, The Glen A, The Glen B, Blackpool A, Blackpool B, Whitechurch and St. Marys DEDs, as shown in Figure 4.1, the latter two of which are outside the city environs. The total Study Area has a combined population of 23,002 persons, and comprises of a total land area of 53.63 square kilometers. (Source: CSO Census of the Population 2011). The proposed works will take place

4.3.2 Settlements and Planning Policy

The major settlement within the Study Area is Blackpool, though most of the study area is within the environs of Cork City. Blackpool is identified as a 'key centre' (or 'district centre') and as a 'gateway to the city' within the North Blackpool Local Area Plan (LAP). It is also identified in the LAP as an important employment location and as a 'second-tier retail centre'. The N20 National Primary Road runs through Blackpool from the city centre to the south, towards the northwest, out of the city. The Bride River flows southwards through the centre of Blackpool, with much of the river having been culverted incrementally.

Local area plans were completed for both Blackpool north and Farranferris, both of which are within the study area for the proposed drainage scheme. According to the Local Area Plan for Blackpool North, the main purpose of the plan for the area is as follows:

'The purpose of the plan is to set out an integrated land use, transportation and urban design framework to facilitate the sustainable redevelopment of the North Blackpool area, centred on a high quality public transport hub at the proposed Kilbarry/Blackpool commuter rail station.'

According to the Local Area Plan for Farranferris, the plan aim for the area is as follows:

'To promote the social, economic, cultural and physical development of the plan area and create an integrated, vibrant and sustainable living, working and recreational environment.'

In the period 2006 – 2011 the Cork City Electoral Area population decreased marginally from 119,418 to 119,230; a decrease of 0.2%. In the same period, the Blackpool District Electoral Divisions (Blackpool A and Blackpool B), experienced positive population growth of 15.5% (from 2,076 to 2,490 persons).

Overall, the Cork Area Strategic Plan Update (2006 to 2020) proposes an increase in the population of Cork City of 25% (to 150,000 persons) by 2020. The northeast and northwest of the city have a proposed increase of population by 11% (to 54,302 persons by 2020).

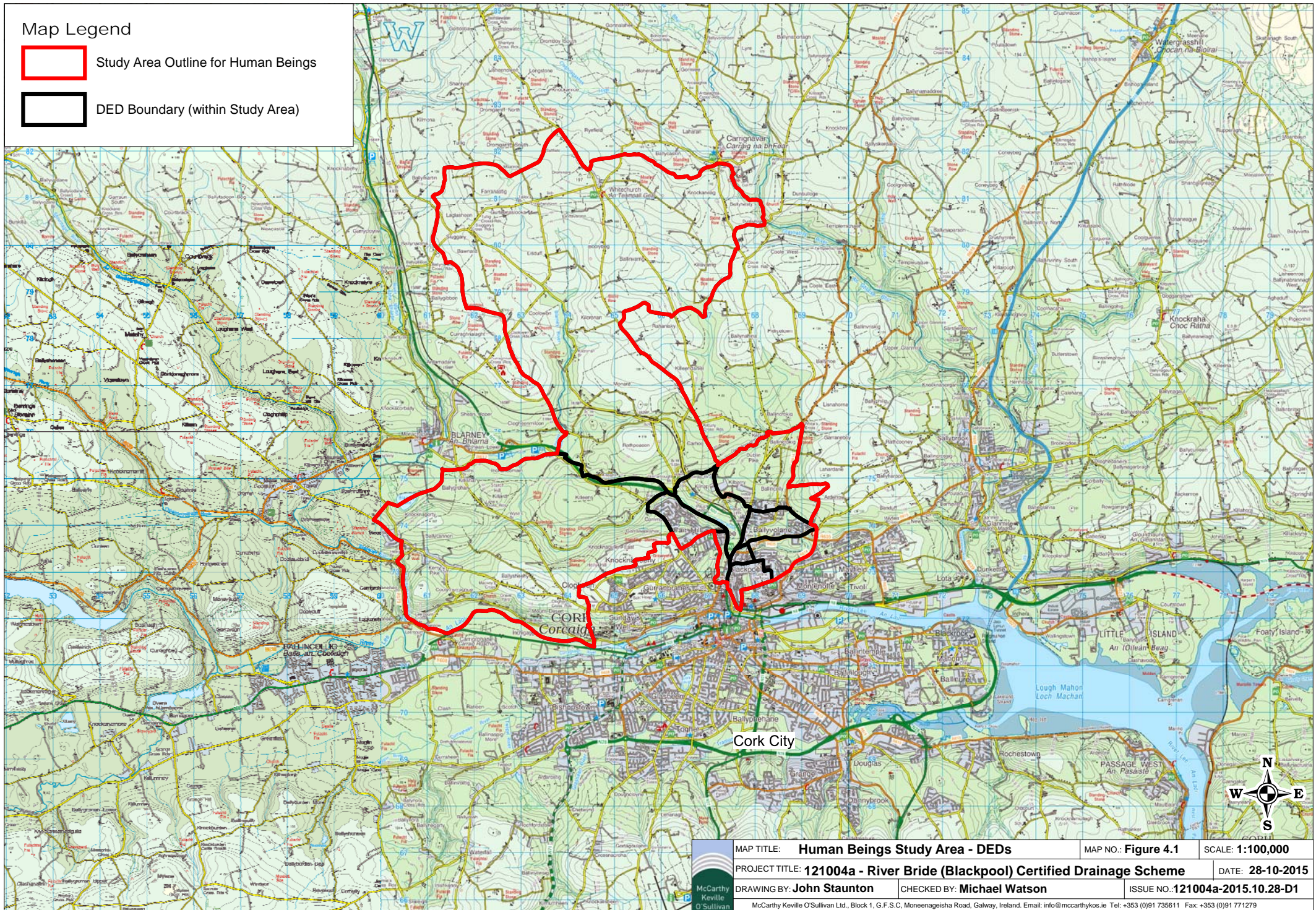
Map Legend



Study Area Outline for Human Beings



DED Boundary (within Study Area)



	MAP TITLE: Human Beings Study Area - DEDs	MAP NO: Figure 4.1	SCALE: 1:100,000
	PROJECT TITLE: 121004a - River Bride (Blackpool) Certified Drainage Scheme	DATE: 28-10-2015	
	DRAWING BY: John Staunton	CHECKED BY: Michael Watson	ISSUE NO: 121004a-2015.10.28-D1
McCarthy Keville O'Sullivan	McCarthy Keville O'Sullivan Ltd., Block 1, G.F.S.C. Moneenagisha Road, Galway, Ireland. Email: info@mccarthys.ie Tel: +353 (0)91 735611 Fax: +353 (0)91 771279		

Several areas have been zoned for residential (in addition to local services, institutional uses and civic uses) development in the LAP for North Blackpool. These include the areas north of the Mallow road and east of the Redforge road, Spring Lane, Dublin Street, Dublin Hill and the upper areas on Commons Ridge. The use of this residential zoning means that the problem of local population decline can be addressed.

4.3.3 Population

4.3.3.1 Population Trends

In the four years between the 2006 and the 2011 Censes, the population of Ireland increased by 8.2 per cent. During this time, the population of County Cork grew by 11.4% to 399,802 persons while Cork City decreased 0.2% to 119,230. Other population statistics for the State, Cork and the Study Area have been obtained from the Central Statistics Office (CSO) and are presented in Table 4.1.

Table 4.1 Population 2002 – 2011 (Source: CSO)

Area	Population		% Population Change
	2006	2011	2006-2011
State	4,239,848	4,588,252	8.2%
County Cork	361,877	399,802	10.1%
Cork City	119,418	119,230	-0.2%
Study Area	21,968	23,002	4.7%

The data presented in Table 4.1 shows that the population of the Study Area increased by 4.7% between 2006 and 2011. This rate of population growth is lower than that recorded at State and County level during 2002-2006 and significantly higher at State and County level for the period 2006-2011. When the population data is examined in closer detail, it shows that the rate of population increase within the Study Area has been unevenly spread through the District Electoral Divisions (DEDs). The highest rate of population increase between 2006 and 2011 occurred within Whitechurch DED, which experienced a 28.9% population increase. In comparison, the population of The Glen B DED decreased by 9.1% during the same time period.

Of the DEDs that make up the Study Area for the purposes of this assessment, the highest population was recorded in St. Marys DED, with 5,158 persons recorded during the 2011 Census. The lowest population was recorded in Blackpool A DED, with 663 persons recorded during the 2011 Census.

4.3.3.2 Population Density

The population densities recorded within the State, County Cork and the Study Area during the 2011 Census are shown in Table 4.2.

Table 4.2 Population Density in 2011 (Source: CSO)

Area	Population Density(Persons per square kilometre)
State	67.0
County Cork	53.7
Cork City	3078.5
Study Area	391.21

The population density of the Study Area recorded during the 2011 Census was 428.9 persons per square kilometre. This figure is significantly higher than the national and county population densities of 67 persons per square kilometre and 53.7 persons per square kilometre respectively. It is also significantly lower than the population density of Cork City, which is 3078.5 persons per square kilometre, though this is likely a result of the inclusion of two county DEDs, Whitechurch and St. Marys, in the Study Area.

Similar to the trends observed in population, the population density recorded across the Study Area varies between DEDs. Whitechurch DED has the lowest population density, at 94.0 persons per square kilometre, while Fannferris A DED has the highest population density, at 7,248 persons per square kilometre.

4.3.3.3 Household Statistics

The number of households and average household size recorded within the State, County Cork and the Study Area during the 2002, 2006 and 2011 Censuses are shown in Table 4.3.

Table 4.3 Number of Households and Average Household Size 2006 – 2011 (Source: CSO)

Area	2006		2011	
	No. of House-holds	Avg. Size (persons)	No. of House-holds	Avg. Size (persons)
State	1,469,521	2.8	1,654,208	2.8
County Cork	123,295	2.94	172,042	2.32
Cork City	43,939	2.72	55,633	2.14
Study Area	7,379	2.58	9,183	2.17

In general, the figures in Table 4.3 show that while the number of households at State, County, City and Study Area level has increased, the average number of people per household has decreased slightly, i.e. there are more households but less people per house. Average household size recorded within the Study Area during the 2006 and 2011 Censuses is in line with that observed at State and County level during the same time periods.

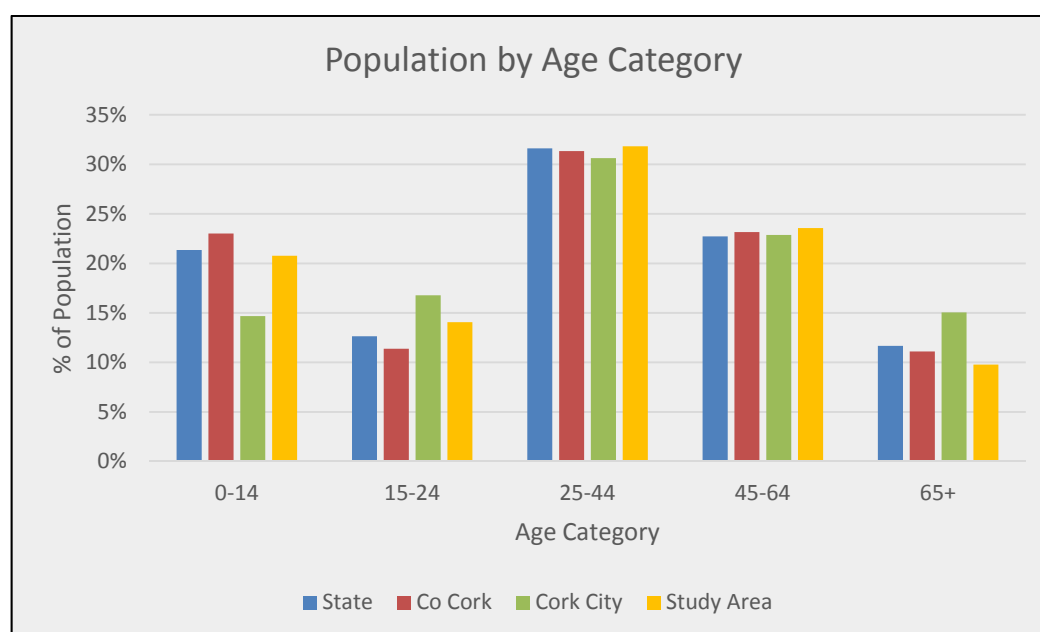
4.3.3.4 Age Structure

Table 4.4 presents the percentages of the State, County Cork and Study Area population within different age groups as defined by the Central Statistics Office during the 2011 Census. This data is also displayed in Figure 4.2.

Table 4.4 Population per Age Category in 2011 (Source: CSO)

Area	Age Category				
	0 - 14	15 – 24	25 - 44	45 - 64	65 +
State	21.3%	12.6%	31.6%	22.7%	11.7%
County Cork	23.0%	11.4%	31.3%	23.2%	11.1%
Cork City	14.7%	16.8%	30.6%	22.9%	15.1%
Study Area	20.8%	14.1%	31.8%	23.6%	9.8%

The proportion of the Study Area population within each age category is similar to those recorded at national, County and City level. The most significant difference occurs where only 9.8% of the population within the study area falls into the 65+ age category, this may indicate the movement of younger age groups into the area for employment. Within the Study Area, the highest population percentage occurs within the 25-44 age category.

**Figure 4.2 Population per Age Category in 2011 (Source: CSO)**

4.3.4 Employment and Economic Activity

4.3.4.1 Sources of Employment

Blackpool is located in the north side of Cork City, which is the second largest city in the state, and is the designated gateway city of the south-west region. This proximity to an employment centre therefore influences the employment opportunities available to inhabitants of Blackpool and surrounding areas. The primary types of employment provided in Blackpool are service and office based employment, in addition to employment generated by manufacturing industries.

The 2011 census also provided information about the journey time to work, school or college where applicable.

Within the 9 ED Study Area, 71.3% of respondents have a journey time of less than 30 minutes to their work or education, which indicates that the majority of employment and educational facilities are located

relatively close by. The 2011 Census data for the EDs in the Study Area shows that the industries which employ the greatest percentage of persons are Commerce and Trade (22.4%), Professional Services (21.0%) and 'Other' (18.1%). A greater percentage of females are employed in the professional services and Commerce and Trade industries; with a larger proportion of males employed in the Manufacturing and Building and Construction Industries.

4.3.4.2 Proposed Employment

It is estimated that the proposed River Bride (Blackpool) certified drainage scheme will provide employment during the construction phase, which is expected to be approximately 18 months in duration. It is likely that at least some prospective employees will be sourced from the local area, therefore benefitting the local economy and skill base to some extent. There will also be indirect employment during the construction phase of the proposed development such as hauliers and waste contractors among others.

4.3.4.3 Economic Status of the Study Area

The labour force consists of those who are able to work, i.e. those who are aged 15+, out of full-time education and not performing duties that prevent them from working. In 2011, there were 2,232,203 persons in the labor force in Ireland. Table 4.5 shows the percentage of the total population aged 15+ who were in the labor force during the 2011 Census. This figure is further broken down into the percentages that were at work, seeking first time employment or unemployed. It also shows the percentage of the total population aged 15+ who were *not* in the labor force, i.e. those who were students, retired, unable to work or performing home duties.

Table 4.5 Economic Status of the Total Population Aged 15+ in 2011 (Source: CSO)

		Status	State	County Cork	Cork City	Study Area
% of population aged 15+ who are in the labor force			61.9%	62.7%	60.9%	60.1%
% of which are:	At work		81.0%	85.2%	77.8%	76.3%
	First time job seeker		1.5%	1.0%	1.8%	1.6%
	Unemployed		17.5%	13.8%	20.3%	22.1%
% of population aged 15+ who are not in the labour force			38.1%	37.3%	39.1%	39.9%
% of which are:	Student		29.7%	28.4%	32.2%	26.5%
	Home duties		24.7%	27.1%	19.4%	25.8%
	Retired		33.2%	32.8%	32.9%	26.9%
	Unable to work		11.4%	10.8%	14.4%	19.4%
	Other		1.0%	0.9%	1.0%	1.5%

Overall, the principal economic status of those living in the Study Area is similar to that recorded at national, County and City level. The main difference is the 26.9% in the 'Retired' category. This is in line with the low population percentage found within the 65+ age group. Of those who were not in the labour

force during the 2011 Census, slightly higher percentages of the Study Area population were in the unable to work category than are recorded at national, County and City levels.

4.3.4.4 Employment by Socio-Economic Group

Socio-economic grouping divides the population into categories depending on the level of skill or educational attainment required. The 'Higher Professional' category includes scientists, engineers, solicitors, town planners and psychologists. The 'Lower Professional' category includes teachers, lab technicians, nurses, journalists, actors and driving instructors. Skilled occupations are divided into manual skilled, such as bricklayers and building contractors; semi-skilled, e.g. roofers and gardeners; and unskilled, which includes construction labourers, refuse collectors and window cleaners. Figure 4.3 shows the percentages of those employed in each socio-economic group in the State, County Cork, Cork City and the Study Area during 2011.

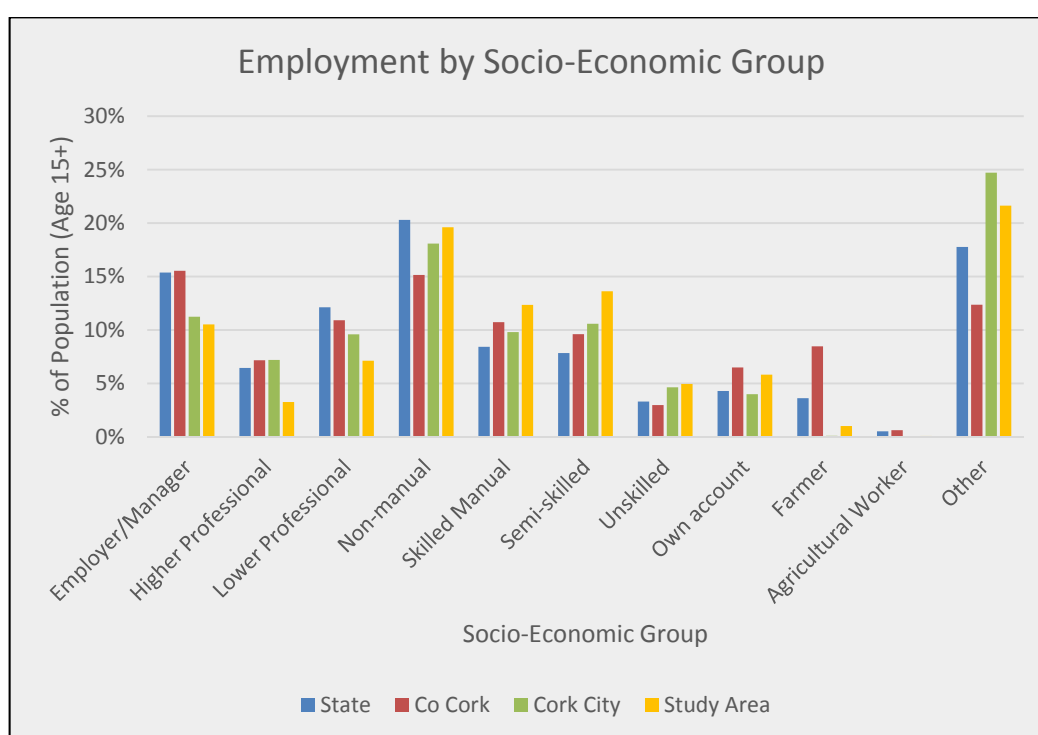


Figure 4.3 Employment by Socio-Economic Group in 2011 (Source: CSO)

The highest level of employment within the Study Area was recorded in the Other category. Approximately 21.6% of those employed within the Study Area form part of this category, in line with the 24.7% of the City population and 17.8% of the national population, though much higher than the 12.4% of the County population. After Other, the next highest levels of employment within the Study Area are in the Non-manual and Semi-skilled categories. The categories in which the lowest percentage of the Study Area population was recorded are Agricultural Worker (0.1% of the Study Area population) and Farmer (1.0% of Study Area population).

The CSO figures for socio-economic grouping have a limitation of including the entire population, rather than just those who are in the labour force. It is likely that this is what gives rise to the high proportion of the population shown to be in the "Other" category in Figure 4.3.

4.3.5 Land-use

Results for the agricultural census are only available for the DEDs located in County Cork. Those within the City environs are excluded to retain the anonymity of landowners. Therefore, the following information relates only to Whitechurch DED and St. Marys DED, both outside the city. The total area of farmland within the Study Area for the Human Beings assessment measures approximately 3,874 hectares or 74.6% of the DEDs from which the data is taken (or 71.4% of the total Study Area including all 9 DEDs), according to the CSO Census of Agriculture 2010. There are 75 farms located within the Study Area (DEDs from which data is taken), with an average farm size of 69.1 hectares. This is slightly larger than the 40.98 hectare average farm size for County Cork. Within the Study Area (DEDs from which data is taken), farming employs 188 people, and the majority of farms are family-owned and run. Table 4.6 shows the breakdown of farmed lands within the Study Area. Pasture accounts for the largest proportion of farmland, followed by silage.

Table 4.6 Farm Size and Classification within the Study Area in 2000 (Source: CSO). Note that 'Study Area' here refers to the Whitechurch and St. Marys DEDs only, as data was not available for DEDs within the city

Characteristic	Value
Size of Study Area	5,180 hectares
Total Area Farmed within Study Area	3,874 hectares
Farmland as % of Study Area	86.7%
Breakdown of Farmed Land	Area (hectares)
Total Pasture	1,883 ha
Total Silage	1,176 ha
Rough Grazing	97 ha
Total Hay	115 ha
Total Potatoes	0 ha
Total Cereals	391 ha
Total Crops	530 ha

4.3.6 Services

The proposed development site is located within the functional area of the North Blackpool Local Area Plan (LAP), 2011 2019 and the Farranferris Local Area Plan 2009. The proposed development site is predominantly part of the greater Cork City, and the area is described in the North Blackpool LAP as the traditional economic/industrial heart of Cork City's northside.

4.3.6.1 Education

There are several National Schools located near the proposed development works site including one located approximately 300 metres to the south (in south Blackpool), two located approximately 400 metres to the southwest, one located approximately 500 metres to the east and one located approximately 600 metres west of the proposed development site. The nearest secondary schools are located approximately 400 metres to the southwest and 600 metres to the southeast of the proposed development site.

4.3.6.2 Access and Public Transport

The proposed development site is accessed via local roads off the N20 National Road, which travels in a general northwest-southeast direction through the proposed development site. The R635 links with the N20 National Route, adjacent to east of the site. The N20 runs in a north-south direction approximately 8km east of the proposed development site. There are several other national roads within a ten-kilometre radius of the site, including the N22, N71, N27, N28, N40, N8 and the M8 Motorway. These generally run from the city centre outwards, with all but the N8 and M8 being on the southern side of the city.

The site of the proposed development is served by public transport. The nearest train station to the proposed development site is Kent Station, located in Cork City Centre, located approximately 1.4 kilometres southeast of the site. Local city bus services operate through the city, including the Blackpool area. From the main bus station, located approximately 900 metres southeast of the site, there are Bus Eireann connections to a significant number of destinations including Dublin, Limerick and Waterford. Cork Airport is located approximately 6.5 kilometres south of the proposed development site.

4.3.6.3 Amenities and Community Facilities

There are numerous amenities and community facilities, including GAA and other sports clubs, youth clubs and recreational areas available in the Blackpool area and throughout the wider northside of Cork City. There is an artificial sports field located adjacent to the Blackpool Community centre. Glen Rovers GAA club is located to the east of the proposed development site. This has been one of the most successful clubs in Cork, and is a main focal point in the community.

There is a Foroige youth club located in the Blackpool Retail Park. The Glen Amateur Boxing Club is also located in the Blackpool area. Also nearby are other sporting facilities and groups, including martial arts and soccer clubs.

Retail and personal services within the vicinity are provided in Blackpool, which has a shopping centre adjacent to the proposed development site, in addition to nearby retail park and industrial estates. Blackpool also enjoys some community facilities in the form of public houses, community centres, shops, post offices and Churches.

4.4 Tourism

4.4.1 Tourist Numbers and Revenue

Tourism is one of the major contributors to the national economy and is a significant source of full time and seasonal employment. During 2014, total tourism revenue generated in Ireland was €6.6 billion, an increase of approximately 9.3% from the previous year. Overseas tourist visits to Ireland in 2014 grew modestly by 6.2% to 7.1 million. (*Tourism Facts 2014*, Fáilte Ireland, September 2015)

Ireland is divided into seven tourism regions. Table 4.7 shows the total revenue and breakdown of overseas and domestic tourist numbers to each region in Ireland during 2013. Figure 4.4 illustrates the total number of tourists per region in 2012. (*Regional Tourism Performance in 2013*, Fáilte Ireland, October 2014)

Table 4.7 Preliminary Overseas Tourists Revenue and Numbers 2013 (Source: Fáilte Ireland)

Region	Total Revenue (€m)	Total Number of Overseas Tourists (000s)
Dublin	€1,401 m	3,998
East & Midlands	€287 m	772
South-East	€204 m	785
South-West	€616 m	1,860
Shannon	€251 m	931
West	€371 m	1,203
North-West	€176 m	506
Total	€3,316 m	6,689

The South-West region, in which the site of the proposed development is located, comprises County Cork and County Kerry. This Region benefited from approximately 28% of the total number of overseas tourists to the country and approximately 19% of the total tourism income generated in Ireland in 2013. Table 4.8 shows the breakdown of overseas tourist numbers to the South West Region during 2013 and the associated revenue generated. The regional data shows that County Cork had the highest tourism revenue and the highest number of overseas tourists within the Region during 2013.

Table 4.8 Overseas Tourism to South-West Region during 2012 (Source: Fáilte Ireland)

County	Revenue Generated by Overseas Tourists (€m)	No. of Overseas Tourists (000s)
Cork	433	1,228
Kerry	183	877

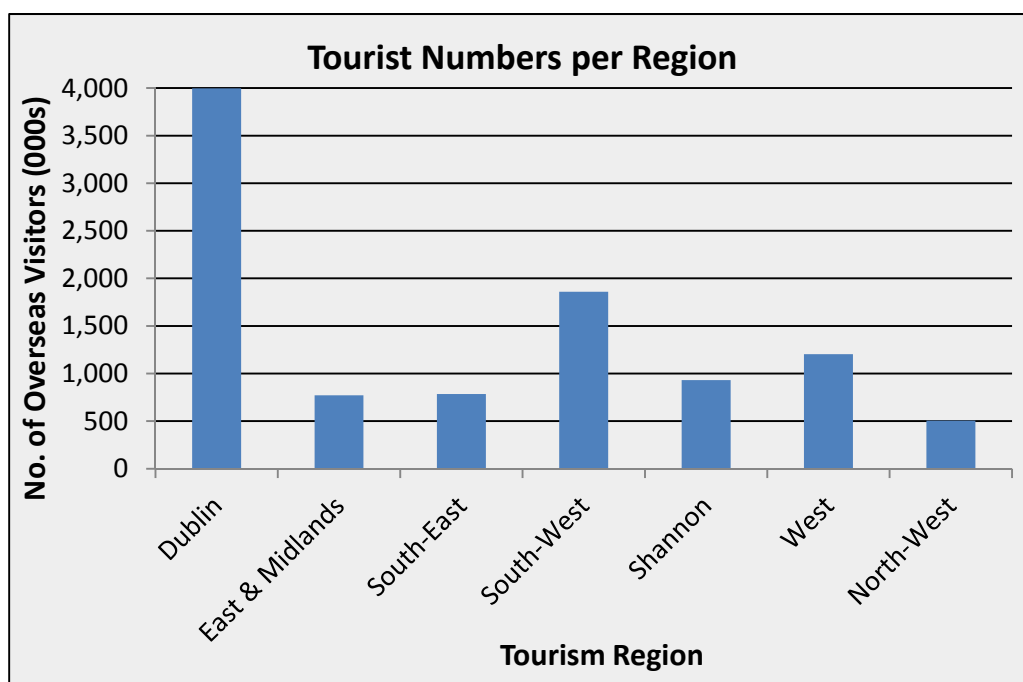


Figure 4.4 Total Overseas Tourists per Region in 2013 (Source: Fáilte Ireland)

Figure 4.5 provides Fáilte Ireland figures showing the type of activities that domestic tourists engaged in during 2014 throughout Ireland. From these figures it can be seen that hiking/hillwalking visits form the majority of all activities enjoyed followed by visits to houses and castles. Activities with the least interest include angling, attending horse racing and equestrian pursuits.

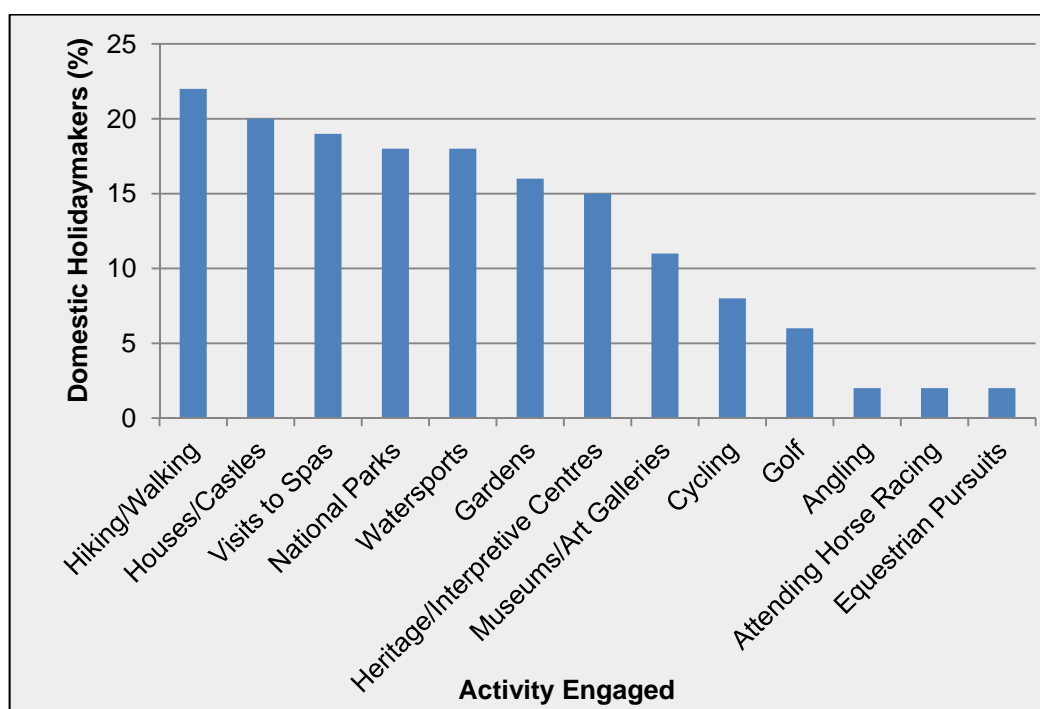


Figure 4.5 Activities undertaken by domestic visitors in Ireland in 2014 (Source: Fáilte Ireland)

4.4.2 Tourist Attractions

The Cork City and County Archive is located adjacent to the proposed development area, which lies on the northern side of Cork City. This contains an extensive archive of various documents relating to all aspects of Cork History. The Cathedral of St. Mary and St. Anne is located just to the south of the proposed development. Known locally as the North Cathedral, it was opened in 1808, with a church on the site since the 1730s. The nearest tourist information centre to the proposed development site is in Cork city centre, located approximately one kilometre south of the site. Tourist attractions within Cork city centre include Crawford Art Gallery, Tigh Fili Gallery, Elizabeth Fort and Red Abbey along with many more listed on the Discover Ireland website. Within the greater area of Cork City golf, horse riding, cycling and angling are available.

The most recent report on Angling tourism in Ireland found that €121 million was spent by the 150,000 angling visitors to the country in 2012. Sections of the river Bride and River Lee further upstream of Cork City are used for angling, particularly the River Lee.

4.5 Health and Safety

There has been an extensive history of flooding in the Blackpool area of Cork City in recent years. Prior to the early 2000s, the primary source of flood risk came from the Glen River, while after this time main source of flood risk has been the River Bride. Figure 2.4 below summarises the recent flood history and illustrates the flood risk of both watercourses. Figure 2.4 also shows the dates of culvert construction works as part of what was known as the Glen-Bride-Kiln (GBK) River Improvement Scheme. This work appears to have alleviated the flooding on the River Glen. Appendix 2A shows the existing flood extents in the Blackpool area.

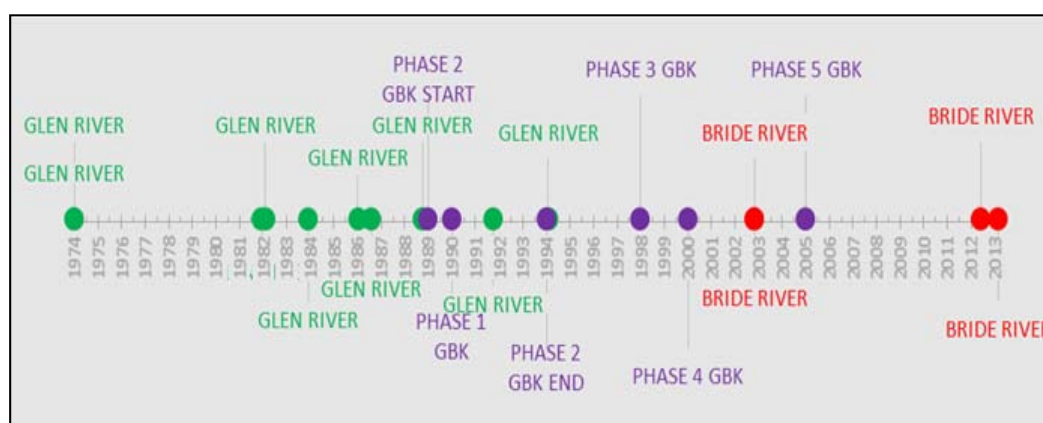


Figure 4.6 Timeline and source of recent flood events in Blackpool showing River Improvement Scheme work phases

4.6 Likely and Significant Impacts and Associated Mitigation Measures

This section deals with the impacts of the proposed development on the population of the Study Area with regard to population, employment and economic activity, land use, services and tourism. As well as these the health and safety, dust, noise and traffic impacts will be dealt with. Noise and traffic impacts will be dealt with in more detail in Chapters 8 and 11 respectively.

4.6.1 'Do-Nothing' Scenario

If the proposed development were not to proceed, the existing river channel would remain as it is, resulting in many of the same potential impacts on human beings as have occurred previously.

There would also be potential for impact on:

- Residential and commercial properties
- Potential public health risk
- Pedestrian walkways
- Roads and Transportation Network
- Wastewater Collection Network
- Surface Water Collection Network
- Water Distribution Network
- Bord Gáis Distribution Network
- Electricity Network
- Telecommunications Network

If the proposed development were not to proceed, the opportunity to protect Blackpool and surrounding areas in Cork City from future flooding events would be lost, as would the opportunity to create employment during the construction phase.

4.6.2 Construction Phase

4.6.2.1 Employment, Economic and Investment Impacts

Potential Impacts

The construction cost of the project will be in the region of €8.5 million. The construction phase of the proposed development will last approximately 18 months. Many construction workers and materials will be sourced locally, thereby helping to sustain employment in the construction trade. **This will have a short-term significant positive impact.**

The injection of money in the form of salaries and wages to those employed during the construction phase of the proposed project has the potential to result in an increase in household spending and demand for goods and services in the local area. This would result in local retailers and businesses experiencing a short-term positive impact on their cash flow. **This will have a short-term slight positive indirect impact.**

The proposed development will result in an influx of skilled people into the area, bringing specialist skills for both the construction and operational phases that could result in the transfer of these skills into the local workforce, thereby having a long-term positive impact on the local skills base. Up-skilling and training of local staff in the particular requirements of flood relief and drainage schemes is likely to lead to additional opportunities for those staff as additional river drainage schemes are implemented in Ireland. **This will have a long-term moderate positive indirect impact.**

There is also the potential for short term disruption to economic activity due to the proposed construction activities. This would predominantly be as a result of traffic and access issues which could have the

potential to reduce footfall into local businesses, with noise and dust from the works adding to this impact on local businesses. **This will have a short-term moderate negative indirect impact.**

Mitigation Measures

A traffic management plan (such as rolling traffic management) will be prepared and implemented for the duration of the works in order to ensure that any impacts on traffic mobility are minimised. This will also result in a minimised potential impact on local businesses, as traffic management will only implement restrictions to local businesses only when necessary and only for the shortest possible time. In addition, works will be limited to normal working hours, and will account for peak business periods, such as the Christmas shopping period. For this period it is recommended that works would be paused from the beginning of the second week in December until the end of the first week in January. An Environmental Management Plan will be implemented during the construction phase to ensure that environmental nuisances relating to the works are minimised. This will include measures to avoid and reduce noise and dust.

Residual Impacts

The residual impacts will be short term and slight. The implementation of a Traffic Management Plan and Environmental Management Plan to reduce traffic and environmental nuisance impacts on the receiving environment during the construction phase will minimise the impact on local businesses. By ensuring that works account for busy periods for local businesses (e.g. Christmas), the impact on times of peak economic turnover will be greatly minimised.

4.6.2.2 Population

Those working on the construction phase of the proposed development will travel daily to the site from the wider area. The construction phase will have no impact on the population of the Study Area in terms of changes to population trends or density, household size or age structure. **There will be no impact on population.**

4.6.2.3 Tourism

Potential Impacts

The proposed works will have little impact on many sectors of the tourism industry in Blackpool. Angling does not form a significant part of the industry in Blackpool. Angling in areas upstream of Blackpool and elsewhere in the catchment is unlikely to be affected by the proposed works and thus the impact is considered to be **imperceptible**. Potential increases in noise and dust levels, traffic issues and temporary impacts on visual amenity related to the works are likely to deter and/or disturb visitors during the construction phase. **There could be a potential short-term slight negative impact on tourism.**

Mitigation Measures:

Works will be designed to minimise impacts upon the amenity value of the study area during the construction period. Mitigation will include measures to minimise pollution of the river, minimise impacts on fish, limit working hours and prevent un-necessary damage to bankside habitats.

The implementation of a Traffic Management Plan and Environmental Management Plan to reduce traffic and environmental nuisance impacts on the receiving environment during the construction phase will minimise the impact on tourism.

Residual Impacts:

Although upstream stretches of the River Bride will remain unaffected by the works and impacts on the water quality of the river downstream of the works will be minimised through implementation of mitigation measures. The amenity value of the River Bride within sections of the work area will be diminished for tourists for the duration of the works. Therefore the nature of the impact on tourism overall will remain slight during the construction phase of the scheme.

4.6.2.4 Noise**Potential Impacts**

There will be an increase in noise levels in the vicinity of the proposed development site during the construction phase, as a result of machinery and construction work. These impacts will be short-term in duration on any particular day and temporary (for the duration of the construction phase). The primary noise producing activities associated with the proposed works include:

- Embankment construction works, involving use of 1-2 midsize tracked excavators, and possibly a small number of dumpers or dump trucks. Such works are proposed at the Commons Inn, at Blackpool Retail Park, and adjacent to the secluded dwelling near the railway bridge.
- Concrete breaking may be required at several locations, involving either hydraulic breakers on tracked excavators, or handheld pneumatic breakers powered by compressors. Concrete saws may also be required.
- Wall and parapet wall repair and construction works, proposed between North Point Business Park and Blackpool Shopping Centre, and adjacent to the dwelling at the end of the Killeens off-ramp, are likely to involve a number of activities, including blockwork and concrete pours. Plant such as telescopic handlers and mini-excavators may be required. Various activities are likely to require mobile generators to power equipment, lights and pumps. Larger works areas are likely to be surrounded by temporary hoarding to a height of 2.4 m.
- Although the construction method for the proposed sediment trap at Sunbeam has yet to be finalised, one of the possible methods is sheet piling. While unlikely, sheet piling may also be required at other works zones. The requirement for piling, and selection of piling method, will not be determined until site specific investigations are undertaken in due course. Sheet piling may involve use of driven or pressed-in piles, or use of vibro-displacement techniques.

- Removal of excavated material, rubble and spoil, and deliveries of concrete and other materials will require a large number of HGV movements throughout the project. These will be concentrated at specific areas where easements are available.

Construction noise at any given noise sensitive location will be variable throughout the construction project, depending on the activities underway and the distance from the main construction activities to the receiving properties. The potential noise impacts that will occur during the construction phase of the proposed development are further described in Section 8 of this EIS. **This will have a short-term negative slight impact.**

Mitigation

Best practice measures for noise control will be adhered to onsite during the construction phase of the proposed development in order to mitigate the slight short-term negative impact associated with this phase of the development. The measures include:

- Sensitive location of equipment, taking account of local topography, existing structures (i.e. walls, buildings, etc.) and natural screening.
- Working methods: construction noise will be controlled by prescribing that standard construction work will be restricted to the specified working hours. Any construction work carried out outside of these hours shall be restricted to activities that will not generate noise of a level that may cause a nuisance. The phasing of works has also been designed with regard to avoidance of noise impacts.
- Plant will be selected taking account of the characteristics of noise emissions from each item. All plant and machinery used on the site shall comply with E.U. and Irish legislation in relation to noise emissions. The timing of on- and off-site movements of plant near occupied properties will be controlled.
- Operation of plant: all construction operations shall comply with guidelines set out in British Standard documents 'BS 5338: Code of Practice for Noise Control on Construction and Demolition Sites' and 'BS5228: Part 1: 1997: Noise & Vibration Control on Construction and Open Sites'. The correct fitting and proper maintenance of silencers and/or enclosures, the avoidance of excessive and unnecessary revving of vehicle engines, and the parking of equipment in locations that avoid possible effects on noise-sensitive locations will be employed.
- Training and supervision of operatives in proper techniques to reduce site noise, and self-monitoring of noise levels, if appropriate.

Residual Impacts

The residual impacts will be imperceptible

4.6.2.5 Dust

Potential Impacts

Potential dust emission sources during the construction phase of the proposed development include excavation activities, backfilling with aggregate, and resurfacing works. This may cause nuisance to residents and local businesses as well as road users. These impacts will not be significant given the localised nature of the proposed works and will be relatively short-term in duration. **There is the potential to have a short-term slight negative impact.**

Mitigation

In periods of extended dry weather, dust suppression (localised wetting of surfaces) may be necessary within and around the site to ensure dust does not cause a nuisance.

Residual Impacts

The residual impacts will be imperceptible

4.6.2.6 Traffic and Transport Infrastructure

The proposed scheme has the potential to impact on the transport infrastructure in the area, most significantly during the construction phase. This impact is likely to occur where four masonry bridges will be replaced, three culverts will be replaced and one new culvert will be constructed.

The construction phase will have a temporary impact on traffic volumes in Blackpool and the immediate surrounds due to the increase in additional traffic movements associated with the site investigation, construction of new infrastructure including bridges, culverts, walls, embankments, parapets etc. However, taking into account the large numbers of vehicles using the road network in and in the vicinity of Blackpool, it is unlikely that traffic generated during the construction phase will have a significant impact on traffic flow in general. It is not anticipated that the construction traffic will significantly affect the flow of traffic through Blackpool and its surrounds

It is likely that temporary road closures will be required during the construction phase of the works at several locations. The partial closures of the Watercourse Road at Blackpool Church and at Maddens Buildings will cause significant disruption to the traffic flow in the Blackpool area.

A complete Traffic and Transportation Assessment (TTA) of the proposed development has been carried out which quantifies and assesses the potential impacts. The full results of the TTA are presented in Section 11 of this EIS. This is expected to have a short-term moderate negative impact.

Mitigation

Works will be designed and supervised by a suitably qualified and experienced professional who will be supervised to ensure that the works are carried out correctly. This will ensure that the bridges will be constructed safely and ensure the structural integrity of the structure. Excavation and reinstatement of the

Watercourse Road and Blackpool Bypass culvert trenches will be carried out in consultation with the Local Authority, and will also follow the Department of Transport, Tourism and Sport published document entitled 'Guidelines for Managing Openings in Public Roads'. These works will be designed and supervised by a suitably qualified and experience professional to ensure they are carried out correctly.

The localised traffic disruptions as a result of other proposed works throughout the scheme will be mitigated through the use of industry standard traffic management measures. These traffic management measures should be designed in accordance with the '*Guidance for the Control and Management of Traffic at Roadworks – Second Edition*'.

Construction works in the vicinity of Blackpool Church and Maddens Buildings along Watercourse Road will be planned to take place over the summer in order to minimise traffic disruption. Any road and lane closures will be timed to minimise the impact to the flow of traffic, and if possible work will be carried out at off peak times to reduce the impact, particularly on heavy goods vehicles. All residents and interested parties should be consulted when planning these road closures to optimise the timing of same. A complete schedule of road closures should be published in advance of the works commencing to facilitate residents in making alternative arrangements where necessary.

Residual Impact

Taking into account the abovementioned mitigation measures (and discussed in further detail in Chapter 11 of this EIS), the residual impact of the proposed scheme on the transport infrastructure will be imperceptible.

The Traffic Management Plan will ensure the impact of traffic disruption resulting from the works is minimised. Relatively short, localised delays are likely to be encountered by motorists at the locations of proposed works in the immediate vicinity of the road network. This impact will be a short term impact and there will be no residual impact on completion of the proposed works.

The closure of the Watercourse Road at Blackpool Church and Maddens Buildings to facilitate the proposed works is likely to cause a moderate to significant temporary impact to the flow of traffic in Blackpool. However, there will be no residual impact once the proposed scheme is completed.

4.6.2.7 Services

The majority of proposed works pertaining to the River Bride (Blackpool) certified drainage scheme, described in detail in Chapter 3, are located in or in the vicinity of the River Bride. As such there is limited interaction between the scheme and existing services in the area. Section 11.3 gives further details on the predicted impacts on services for drainage networks, water, gas, electricity broadband and telecommunications distribution networks. Locations where potential impacts are predicted are discussed in section 11.3. Impacts on each service will vary, but overall the proposed drainage scheme will have a **short-term moderate negative impact** on services.

Mitigation Measures:

The depth of the service networks (e.g. surface water and wastewater collection pipework) close to the proposed works areas will be assessed. Should it be anticipated that any proposed excavations will impact on these networks, this will be taken into consideration at detailed design stage and replaced or deepened prior to foundation excavation if necessary.

Prior to excavation, the Contractor will assess record drawings and the results of the Site Investigation in order to determine the exact depth and location of the existing service networks within the works area. The Contractor will carry out additional site investigation to confirm the location of the existing services. This will reduce the risk of striking them and causing interruption to the systems during the construction phase.

Residual Impact:

Taking into account the above mentioned mitigation measures the residual impact of the proposed scheme on the local service networks will be **neutral**.

4.6.2.8 Amenity**Potential Impacts**

During the periods of in-stream works, there will be a significant impact on local amenities related to the use of the Bride River. Riverside walks for residents and visitors alike are of importance to the area, with angling having a minor importance. Although in-stream works will be restricted to two five month periods from May to September inclusive, these months coincide with the period of peak amenity usage of the river. Loss of recreational amenity will be limited to the areas where works are proposed and the area immediately downstream of these works. However as water quality is likely to be adversely affected in the construction phase of the scheme, diminution of the amenity value of the river will occur downstream of the working area also during the construction phase. In addition, the proposed works have the potential to impact negatively on the resident fish stocks and potentially hinder the migration of fish. Indirect impacts may include the smothering of downstream fish gills with suspended solids. The hindrance of migrating fish has the potential to impact on salmonid populations throughout the entire Lee catchment and therefore impact angling not only in the works areas but also on a wider scale. This has the potential to have a **short-term moderate negative impact**.

Mitigation Measures:

Works will be designed to minimise impacts upon the amenity value of the study area during the construction period. Mitigation will include measures to minimise pollution of the river, minimise impacts on fish, limit working hours and prevent un-necessary damage to bankside habitats. Full details of this mitigation is provided in Chapter 5.

Residual Impact:

Although upstream stretches of the River Bride will remain unaffected by the works and impacts on the water quality of the river downstream of the works will be minimised through implementation of mitigation measures, the amenity value of the proposed works areas will be inaccessible to the public within the study area for the duration of the works. Therefore the nature of the impact will remain moderate within and downstream of the works area for residents and visitors during the construction phase of the scheme.

4.6.2.9 Health and Safety Impacts**Potential Impacts**

Construction of the proposed development will necessitate the presence of a construction site. Construction sites and the machinery used on them pose a potential health and safety hazard to construction workers if site rules are not properly implemented. **This will have a short-term potential significant negative impact.**

Mitigation Measures

During construction of the proposed development, all staff will be made aware of and adhere to the Health & Safety Authority's 'Guidelines on the Procurement, Design and Management Requirements of the Safety, Health and Welfare at Work (Construction) Regulations 2006'. This will encompass the use of all necessary Personal Protective Equipment and adherence to the site Health and Safety Plan.

Harris fencing will be erected around any excavations to prevent uncontrolled access to this area. Appropriate health and safety signage will also be erected on this fencing and at locations around the site.

Residual Impact:

The implementation of the Health & Safety Plan will ensure any potential risks are minimised.

4.6.3 Operational Phase**4.6.3.1 Health and Safety**

Flooding poses a risk to human health and safety. The OPW document 'The Planning System and Flood Risk Management: Guidelines for Planning Authorities' (OPW, 2009) states that flooding can cause physical injury, illness and loss of life. Deep, fast flowing or rapidly rising flood waters can be particularly dangerous, with increased risk if the floodwater is carrying debris. Some of these impacts may be immediate, the most significant being drowning or physical injury due to being swept away by floods. Floodwater contaminated by sewage or other pollutants (e.g. chemicals stored in garages or commercial properties) can potentially cause illness, either directly as a result of contact with the polluted floodwater or indirectly as a result of sediments left behind. Flood water may also hide other hazards for wading pedestrians, such as manhole openings where the covers have been lifted by flood flows.

The impact on people and communities as a result of the stress and trauma of being flooded, or even of being under the threat of flooding, can be immense. Long-term impacts can arise due to chronic illnesses and the stress associated with being flooded and the lengthy recovery process. The ability of people to respond and recover from a flood can vary. Vulnerable people, such as those who are old, disabled or have a long-term illness, are less able to cope with floods than others. Some people may have difficulty in replacing household items damaged in a flood and may lack the financial means to recover and maintain acceptable living conditions after a flood. **The proposed relief scheme will have a long-term significant positive impact.**

4.6.3.2 Employment and Investment

The flood relief scheme will provide increased protection to residential and commercial premises and businesses in Blackpool and surrounding areas. This will be likely to encourage future inward investment in the area, creating further employment and a stronger local economy. **The proposed relief scheme will provide a long-term significant positive impact.**

4.6.3.3 Land-use

The construction of culverts over sections of the river will result in increased land area to use for recreational purposes. **This will have a long-term slight positive impact.**

4.6.3.4 Tourism

The operational phase of the proposed development will have **no negative impact** on tourism in the area.

4.6.3.5 Property Values

The flood relief scheme will provide increased protection to residential and commercial premises in Blackpool and surrounding areas. This will be likely to increase the value of properties in the area. **The proposed scheme will provide a long-term significant positive impact.**

Chapter 5:

Flora and Fauna

5. FLORA AND FAUNA

5.1 INTRODUCTION

This section of the Environmental Impact Statement (EIS) describes the potential impacts of the proposed River Bride (Blackpool) Certified Drainage Scheme on flora and fauna and has been completed in accordance with the following guidance documents:

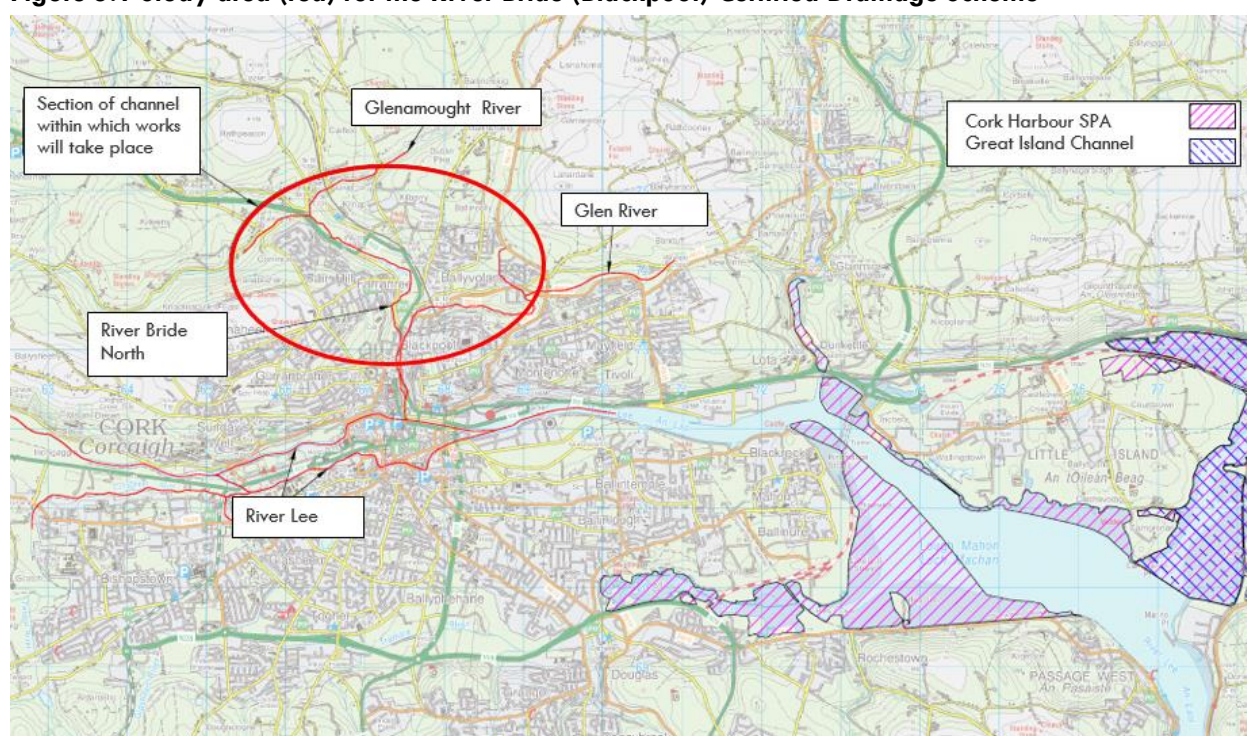
- Environmental Protection Agency (2000). Guidelines on Information to be contained in Environmental Impact Statements.
- Chartered Institute of Ecology and Environmental Management (CIEEM) (2006). Guidelines for Ecological Impact Assessment.
- Chartered Institute of Ecological and Environmental Management (CIEEM) (2012). Preliminary Ecological Appraisal.
- Fossitt JA (2000). A Guide to Habitats in Ireland.
- The Heritage Council (2011) Habitat Survey Guidelines: A Standard Methodology for Habitat Survey and Mapping in Ireland.

5.2 METHODOLOGY AND LIMITATIONS

5.2.1 Desk Study

The study area for this chapter encompasses three major water courses namely the Bride (North), the Glenamought River and the Glen River (see Figure 5.1) located at Blackpool, Cork City. The total catchment area upstream of Blackpool is c 40km².

A desk study was undertaken to determine the proximity of the project to designated areas of conservation utilising the National Parks and Wildlife Service (NPWS) website database. Site synopses, conservation objectives, conservation management plans, site reports etc. were reviewed to identify qualifying interests of relevant sites. The NPWS database and Biodiversity Ireland database were also consulted regarding the occurrence of protected species of flora and fauna in the vicinity of the proposed scheme. Consultations were carried out with the NPWS and Inland Fisheries Ireland (IFI) requesting information on protected species and habitats within the study area as well as comments on the proposed project in relation to survey, assessment and specific mitigation requirements. A review of aerial photography over the entire study was undertaken to prepare a preliminary habitat map and to identify potential ecologically important habitats. The review also aimed to determine the proximity of the proposed drainage scheme to ecologically important sites in the general vicinity that may be subject to indirect impacts through severance of connecting corridors, pollution run-off during construction, etc. Existing sources of information and records on ecological interests were sourced and reviewed.

Figure 5.1 Study area (red) for the River Bride (Blackpool) Certified Drainage Scheme

5.2.2 Field Survey

Following on from the desk study, a series of site surveys were undertaken of the study area, during which habitat mapping was undertaken and the suitability of the works area to support plants, animals or habitats of note was considered. All watercourses within 25m of the proposed works areas were examined with a view to determining presence of species of note and potential ecological risks associated with the proposed drainage scheme. The flora was surveyed through direct observation on-site and the habitats were classified initially from aerial photographs and subsequently ground-truthed at the site. Fauna were surveyed through direct observation of bird and mammal species or of their signs and calls.

A number of site specific targeted surveys were carried out following consultation with NPWS and IFI for the following: bats, otter, kingfisher, floating river vegetation, fish species and Japanese knotweed and other invasive plant species. A summary of the field surveys completed to date is presented in Table 5.1 below.

Table 5.1: Targeted surveys undertaken along the River Bride (North) and Glenamought

Survey Type	Dates of Survey
Windshield habitat survey	18 th June 2013
Walkover Survey /Habitat mapping	April/May 2014, April 2015
Invasive species survey	August-September 2014
Otter Survey	October/November 2014 , April-October 2015
Kingfisher Survey	August – October (end) 2014, May-June 2015
Electrofishing Survey	September 2014,
Floating River Vegetation Survey	August and September 2014, June 2015

5.2.3 Designated Areas in the Vicinity of the Study Area

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

5.2.3.1 Natura 2000 Sites

Screening for Appropriate Assessment (AA) under Article 6(3) of the EU Habitats Directive has been completed and is included in Appendix 5. The following summarises the information from the AA Screening Document. The nearest Natura 2000 sites (cSAC's or SPA's) are:

- Great Island Channel SAC (Site Code:004219)
- Cork Harbour SPA (Site Code 004030)

These designated areas are located within 15km of the proposed River Bride (Blackpool) Certified Drainage Scheme and therefore require screening for Appropriate Assessment.

Cork Harbour SPA is located >5km downstream of the works area. Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Douglas, Owenboy and Owennacurra. The SPA site comprises most of the main intertidal areas of Cork Harbour with the following species designated as conservation interest: Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Dunlin, Blacktailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Black-headed Gull, Common Gull, Lesser Black-backed Gull and Common Tern. Cork Harbour is an internationally important wetland site, regularly supporting in excess of 20,000 wintering waterfowl, for which it is amongst the top five sites in the country (NPWS, 2008).

The Great Island Channel SAC is located >10km downstream of the works area. It stretches from Little Island to Middleton, with its southern boundary being formed by Great Island. The site is a Special Area of Conservation (SAC) selected for the following habitats:

- [1140] Tidal Mudflats and Sandflats
- [1330] Atlantic Salt Meadows

The Appropriate Assessment screening concluded that impacts on the Great Channel Island SAC and Cork Harbour SPA could be precluded on the basis of their distance (>5km downstream) from the proposed Drainage Scheme at Blackpool and the nature and scale of the proposed works, its design and mitigation measures.

5.2.3.2 Other Designated Sites

There are no NHAs or pNHAs within the works area. The closest pNHA's are located either downstream at a distance > 5km, i.e. Dunkettle Shore pNHA, Douglas River Estuary pNHA and Glanmire Wood pNHA, are located upstream a distance of >5km, i.e. Lee Valley pNHA or have no surface water links, i.e. Cork Lough pNHA. Given the distance of these pNHAs from the works area and considering the nature and scale of the works, there is no potential pathway for negative impacts on these pNHAs.

5.2.4 Non Designated Features of Ecological Interest

5.2.4.1 River Lee and Tributaries

The Bride River North is a tributary of the River Lee and the proposed works for the River Bride (Blackpool) Certified Drainage Scheme are located less than 1km upstream of the River Lee. The River Lee with a catchment area of approximately 2000 km², rises in the Shehy Mountains on the western border of County Cork and flows eastwards through Cork City and flows into the sea at Cork Harbour.

Outside of the Gearagh to the west and the coastal transitional habitats of Great Island SAC and Cork Harbour SPA to the east, the aquatic habitats of the River Lee within the Study Area are not designated for nature conservation purposes

The River Lee main channel from source to Cork City waterworks at Lee Road is a designated salmonid fishery under the EC (Quality of Salmonid Waters) Regulations of 1988 (SI 84 of 1988), implementing the Freshwater Fish Directive (78/659/EEC).

In addition to Atlantic salmon, the river and its larger 1st order tributaries, supports a number of other Annex II water dependant species, Annex I habitats and Annex I bird species and features of ecological interest.

The Lees is known to contain populations of brown trout, lamprey, European eel. While the River Bride (North) is known to have poor water quality and has been extensively culverted it is likely to support some Annex II species which move upstream on the tributaries to more suitable habitats in particular during winter floods.

The entire length of the River Lee and its tributaries including the River Bride (North) provide suitable foraging/commuting corridors for otter. Otter holts are not known from within the environs of the city and its 1st order tributaries. A survey by IWT (2012) to evaluate the Otter population in the inner city and the adjacent suburban areas identified a minimum population of 11 No. otters in the city area.

Ranunculus vegetation which corresponds to the Annex I habitat 'Watercourses of Plain to Montane Levels with the *Ranuncion fluitantis* and Callitricho-Batrachion vegetation [3260]' is also known to present within the River Lee. The largest intact populations of *Ranunculus* vegetation are present on the River Lee main channel with smaller more localised populations recorded in the smaller 1st order tributaries e.g. the Bride River North, the Glen River, the Glenamought River and the Ballincolly Stream.

Many of the stone walls in Cork City support a diverse array of species including two listed under the Flora (Protection) Order, 1999, i.e. Roundleaved Cranesbill and Little Robin. These are listed as nationally 'Vulnerable' in the Irish Red Data Book. Little Robin is only known from walls and waste ground in Cork City and in Dungarvan Co Waterford. Roundleaved Cranesbill is found in very few sites in Ireland, one of which is waste ground areas around the city, where it has been recorded in greater numbers than at any of its other sites in Dublin and Wexford (Cork City Council, 2009). These species are absent from the River Bride (North) and its tributaries.

According to (Cork City Council, 2009) the River Lee running west from the City to the Lee Fields is an excellent area for bats. Natteries and Whiskered Bat have also been recorded in the environs the City (e.g. around Glanmire and may also occur in the more wooded areas along the Lee Road, Leemount and along the River Shournagh. There are no records for the River Bride (North) and the associated study area.

The Annex I bird species Kingfisher (*Alcedo atthis*) is known to occur on the River Lee along with Irish Dipper (*Cinclus hibernicus*). The River Lee supports a number of bird species of Special Conservation Interest listed

for the coastal marine habitats of Cork Harbour SPA e.g. Cormorant (*Phalacrocorax carbo*) and Grey Heron (*Ardea cinerea*).

5.2.5 Flora

2.2.5.1 New Flora Atlas

A search was made in the *New Atlas of the British & Irish Flora* (Preston *et al.*, 2002) to find which rare or unusual plant species had been recorded in the 10 km squares in which the River Bride (Blackpool) Certified Drainage Scheme is located (W67, W77). In addition, the NPWS records of protected species in the area of the proposed development were obtained for the relevant 10 km squares. 7 No. species protected under the Flora Protection Order, were recorded in these 10km squares. These species are listed below together with their record period data (Preston *et al.*, 2002) and habitat requirements (Webb, 2012).

- Meadow Barley (*Hordeum secalinum*). Records from pre 1970 and 1987-1999. Upper parts of brackish marshes.
- Small Cudweed (*Logfia minima*). Records from pre 1970 and 1987-1999. Sandy and gravelly places.
- Rough Poppy (*Papaver hybridum*). Records from pre 1970. Sandy fields.
- Pennyroyal (*Mentha pulegium*). Records from pre 1970 and 1987-1999. Damp, sandy places. (W76)
- Lesser Snapdragon (*Misopates orontium*). Records from pre 1970 and 1987-1999. Arable fields.
- Meadow Saxifrage (*Saxifraga granulata*). Records from pre 1970. Sandhills and pastures.
- Annual Knawel (*Scleranthus annuus*). Records from pre 1970. Waste places and roadsides on dry, sandy soils

5.2.5.2 NPWS Records of Protected Species

The NPWS records of protected species in the area of the proposed development were obtained for the relevant 10 km squares. There were records for an additional 2 No. species listed under the Flora Protection Order. These species are listed below together with their record period (as listed on the NPWS database) and habitat requirements (Webb, 2012).

- Wood small-reed (*Calamagrostis epigejos*). Record from 2012. Damp rocky places in west and north.
- Red Hemp Nettle (*Galeopsis angustifolia*). Record from 1856. Calcareous gravels, especially on eskers.

The NPWS database also contained records for a number of rare plant species not protected under the Flora Protection Order. The species together with their status on the Irish Red Data List of Vascular Plants (Curtis and McGough 1988) are listed below:

- Musk Thistle (*Carduus nutans*), Data Deficient (dd). Pastures, heaths and roadsides.
- Little Robin (*Geranium purpureum*) Endangered (E). Formerly protected under 1980 FPO. Rocks and walls.

- Henbane (*Hyoscyamus niger*). Vulnerable (V). Sandy or stony shores.
- Greater Broomrape (*Orobancha rapum-genistae*). Vulnerable (V) Rare (R). Formerly protected under 1980 FPO.
- Heath Cudweed (*Gnaphalium sylvaticum*). Records from 1844 and 1897. Vulnerable (V) Upland pastures and damp, sandy places.

5.2.5.3 Bryophytes

According to the NPWS Rare and Protected Species Records there are 2 No. records for Hasselquist's Hyssop (*Entosthodon fascicularis*), listed as Near Threatened (NT) in the Ireland Red List No. 8: Bryophytes (Lockhart et al. 2012) from the 10km Grid Square W77. There are 3 No. records for Tufted Feather-Moss (*Scleropodium cespitans*), listed as Near Threatened (NT) in the Irish Red List of Bryophytes, from the 10km Grid Square W67.

5.2.6 Fish and Shellfish

5.2.6.1 Freshwater Pearl Mussel

According to the NPWS rare and protected species database there are historical (1903) records for Freshwater Pearl Mussel (*Margaritifera margaritifera*) from the 10km Grid Squares W67. Post 1987 records are for dead shells only. Freshwater Pearl Mussel is listed on Annex II of the EU Habitats Directive. The works in Blackpool, Ballyvollane and Glenamought are not located within a *Margaritifera* sensitive area.

5.2.6.2 Lamprey

According to the NPWS Rare and Protected Species Records and the National Biodiversity Data Centre there are records for brook lamprey (*Lampetra planeri*) from the 10km Grid Squares W66 and W67. There are records for sea lamprey (*Petromyzon marinus*) from the 10km Grid Square W67. Fish stock surveys carried out in the River Lee in 2013 as part of the Water Framework Directive recorded lamprey sp. present in the River Lee. All three lamprey species are listed on Annex II of the EU Habitats Directive.

5.2.6.3 Atlantic Salmon

According to the NPWS Rare and Protected Species Records there is 1 No. record for Atlantic salmon (*Salmo salar*) from the 10km Grid Square W67. The River Lee catchment is classified as an important system for Atlantic salmon (*Salmo salar*). Atlantic salmon was recorded from the River Lee in 2013 during fish stock surveys undertaken as part of the Water Framework Directive. Atlantic salmon is listed on Annex II of the EU Habitats Directive.

5.2.6.4 European Eel

According to the National Biodiversity Data Centre (2014) there are records for European eel (*Anguilla anguilla*) from the 10km Grid Square W67. European eel was recorded from the River Lee in 2013 during fish stock surveys undertaken as part of the Water Framework Directive.

5.2.6.5 Brown Trout

Brown trout was recorded from the River Lee in 2013 during fish stock surveys undertaken as part of the Water Framework Directive.

5.2.7 Birds

The *Atlas of Breeding Birds in Britain and Ireland* (Sharrock, 1976), *'The New Atlas of Breeding Birds in Britain and Ireland: 1988-1991'* (Gibbons *et al.*, 1993) and *'The Atlas of Wintering Birds in Britain and Ireland'* (Lack, 1986) were consulted for information regarding the distribution of birds in Ireland. These atlases show data for breeding and wintering birds respectively in individual 10 km by 10 km squares. However, it should be noted that, for some species at least, more recent work has been carried out. Table 5.2 shows those species found in the relevant 10 km squares, W67 and W77 that are recorded in the Breeding Birds Atlases and are also protected under the EU Birds Directive or mentioned on the Birds of Conservation Concern in Ireland (BoCCI) red list. Birds listed under Annex I are offered special protection by the EU Birds Directive.

Table 5.2 Breeding Bird Atlas Data (W67, W77)

Common Name	Scientific Name	Breeding Atlas 68-72	Breeding Atlas 88-91	Annex I	BoCCI red list
Hen Harrier	<i>Circus cyaneus</i>	✓	✓	Yes	No
Peregrine	<i>Falco peregrinus</i>	✓	✓	Yes	No
Corncrake	<i>Crex crex</i>	✓	X	Yes	Yes
Kingfisher	<i>Alcedo atthis</i>	✓	✓	Yes	No
Merlin	<i>Falco columbarius</i>	✓	✓	Yes	No
Dunlin	<i>Caladris alpina</i>	X	✓	Yes	No
Common Tern	<i>Sterna hirundo</i>	✓	X	Yes	Yes

Seven species listed in Annex I of the EU Birds Directive have been recorded as breeding within the relevant 10km squares, in the Atlases of Breeding Birds; Hen Harrier (*Circus cyaneus*), Peregrine (*Falco peregrinus*), Corncrake (*Crex crex*), Kingfisher (*Alcedo atthis*), Merlin (*Falco columbarius*), Dunlin (*Calidris alpina*) and Common Tern (*Sterna hirundo*). The River Lee itself is known to support kingfisher throughout its length. There is no data relating to the presence of Kingfisher on the Bride River North.

In terms of wintering birds, Table 5.3 shows those species found in the 10 km squares W67 and W77 that are recorded in the Atlas of Wintering Birds in Britain and Ireland 1988-91 and are also protected under the EU Birds Directive or mentioned on the Birds of Conservation Concern in Ireland (BoCCI) red list.

Table 5.3 Wintering Bird Atlas Data

Common Name	Scientific Name	Annex I	BOCCI red list
Whooper Swan	<i>Cygnus cygnus</i>	Yes	No
Kingfisher	<i>Alcedo atthis</i>	Yes	No

Common Name	Scientific Name	Annex I	BOCCI red list
Lapwing	<i>Vanellus vanellus</i>	No	Yes
Curlew	<i>Numenius arquata</i>	No	Yes
Herring Gull	<i>Larus argentatus</i>	No	Yes
Blackheaded Gull	<i>Larus ridibundus</i>	No	Yes
Yellowhammer	<i>Emberiza citrinella</i>	No	Yes
Dunlin	<i>Caladris alpina</i>	Yes	No
Shoveler	<i>Anas clypeata</i>	No	Yes
Pintail	<i>Anas acuta</i>	No	Yes
Knot	<i>Caladris canutus</i>	No	Yes

Three birds recorded as wintering in the relevant 10km square are protected under Annex I of the EU Habitats Directive namely Whooper Swan, Dunlin and Kingfisher. Whooper Swan winter on large waterbodies and the surrounding grasslands. They are a Special Interest Feature for The Gearagh SPA and are known to occur at Inniscarra Reservoir and The Gearagh. Their distribution does not extend to the River Bride (Blackpool) Certified Drainage Scheme. Kingfisher winter in similar habitats to their summer habitats and are also known to occur within the area. Dunlin are common along all coastal areas - especially on tidal mudflats and estuaries.

A further eight birds that are listed on the BoCCI Red list were recorded in the atlas as wintering in the area. These were Lapwing, Pintail, Curlew, Yellowhammer, Knot, Shoveler, Black Headed Gull and Herring Gull. Lapwing winter on farmland and flat coastal areas. Curlew Shoveler and Knot winter on mudflats and adjacent fields. In winter, Pintail form large flocks on brackish coastal lagoons, in estuaries and on large inland lakes. Yellowhammer winter on agricultural land, with adjacent scrub. Black Headed Gull winter on a variety of habitats and Herring Gull winters on lakes, estuaries and open fields. All the above species are potentially found at the locations of the proposed works.

5.2.7.1 NBDC records

In addition to the above bird species, there are also records for Annex I bird species Red-billed Chough (*Pyrrhocorax pyrrhocorax*) and Short-eared Owl (*Asio flammeus*) from the 10km Grid Squares which overlap with the footprint of the proposed works.

5.2.8 Mammals

5.2.8.1 Otter

According to the NPWS Rare and Protected Species Records there are records of the European Otter (*Lutra lutra*) from the 10km Grid Squares W67 which overlaps with the footprint of the proposed works.

The Cork Urban Otter Survey was conducted between 2011 and 2012 identified a minimum population of 11 otters in the city area. Otter records are abundant from the County Hall Salmon Weir on the River Lee

(Carrigrohane) downstream on both the north and south channels as far as the port of Cork. The majority of the records available are of otter scats recorded during the Cork City Urban Otter Survey while a small number of visual records have also been submitted (NBDC, 2014). Otter scat was recorded on the River Bride (North), scat concentrated from two areas at Blackstone Bridge (north of Fair Hill) and east of Faranree on the Commons road.

5.2.8.2 Bats

According to the National Biodiversity Data Centre (2014) there are records for Common Pipistrelle (*Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*), Daubenton's Bat (*Myotis daubentoni*), Leisler's Bat (*Nyctalus leisleri*), Natterer's Bat (*Myotis nattereri*) and Brown Long-eared Bat (*Plecotus auritus*) from the 10km Grid Squares overlapping within the footprint of the proposed works.

5.2.8.3 Harbour Seal and Grey Seal

There are records for harbour seal (*Phoca vitulina*) and grey seal (*Halichoerus grypus*) from the 10km Grid Square W67. The overall conservation status of both species has been assessed as 'Favourable' (NPWS 2013b).

5.2.9 Water Quality

The EPA website, <http://gis.epa.ie/Envision>, contains information regarding water quality in selected Irish rivers based on surveys carried out by the EPA as part of the Water Framework Directive (WFD) Monitoring Programme. Biological information is provided in the form of Q values. The River Bride (North), the Glenamought River and the Glen River do not have any monitored points within the study area, therefore no EPA monitoring data was available for the Bride (North), Glenamought River or the Glen River.

The closest EPA monitoring point on the River Lee, into which the Bride (North) flows is at Leemount Bridge, > 5km upstream of the confluence of the River Bride (North) and the River Lee. The water quality status at this monitoring point is Q4 "Good" status. The River Lee, approximately 3km upstream of the confluence of the River Lee and the River Bride (North) has "moderate" status under The River Waterbody Water Framework Directive (2010-2012 monitoring results).

The lower reaches of the River Lee, into which the Bride (North) is a transitional coastal waterbody, i.e. the Lee (Cork) Estuary Upper. The Lee (Cork) Estuary Upper Transitional Waterbody and the Lee (Cork) Estuary Lower Transitional Waterbody, which lies downstream of the confluence both have "moderate" status under the Transitional Waterbody Water Framework Directive Status (2010-2012 monitoring results).

5.3 Field Surveys

The wider study area was first visited on the 18th June 2013. During this visit, the general habitat types within the Study Area were observed and photographed. The purpose of this was to observe the habitats in the area first hand and to ground truth the findings of the desk study. No detailed floral or faunal surveys were carried out during this visit.

A further and more detailed survey of the River Lee and its tributaries was carried out in April and May 2014 and in April 2015. The survey area included the Bride (North) and a number of smaller rivers including the Glenamought River. The river was systematically walked and each feature (e.g. riffle, pool or glide) was defined visually and mapped using gps technology. These features were then described in terms of substrate conditions, flow path aquatic macrophytes, invertebrate communities and habitat variation and quality.

Substrates were classified by particle size and named in accordance with the EPA, Rivers and Streams Ecological Assessment Field Sheet. Surveys of the terrestrial bankside habitats and mammalian and avifaunal activity were also undertaken. Suitability of habitats for Freshwater Pearl Mussel (*Margaritifera margaritifera*), Lamprey species (*Lampetra* sp and *Petromyzon* sp.) and salmonids was also assessed during this survey.

A number of targeted specialist surveys were carried out between August and November 2014, following consultation with NPWS and again in 2015 (refer to Table 5.1 for details of these surveys).

5.3.1 Habitats and Flora

The study area for this drainage scheme is the rivers Bride (North) and Glenamought in the Blackpool area (Figure 5.1) of Cork City. The ecological character of the study is described below in terms the habitats (as per Fossitt, 2000) present within and adjacent to the footprint of the proposed works. Where habitats are found to have links to or correspond to Annex I habitat the habitats are described in accordance with EC (2007). The habitats within the study area along the Bride (North) and the lower reaches of the Glenamought River to the west of the Glenamought Viaduct are described below.

5.3.1.1 Bride (North)

The Bride (North) consists of a number of distinct riparian zones, both semi-urban and urban. For the purposes of this description the river is divided into a number of sections (Sections 1 to 4), and the habitats present within the footprint of the proposed works within each section are described below.

Section 1: Confluence with River Glenamought River to Commons Inn

The upper reaches of the Bride (North), close to its confluence with the Glenamought River and within the vicinity of North Point Business Park are the least urbanised sections of the river, in relation to survey efforts. This section of the river is short and features a riparian zone containing Scrub (WS1) dominated by sally willow (*Salix cinerea*), ash (*Fraxinus excelsior*), sycamore (*Acer pseudoplatanus*), buddleja (*Buddleja davidii*) and bramble (*Rubus fruticosus* agg.), with more open grassy areas categorised as Dry meadow and grassy verge (GS2). The grassy areas support a wide range of plants including American willowherb (*Epilobium ciliatum*), reed canary grass (*Phalaris arundinacea*), dogwood (localised), field bindweed (*Convolvulus arvensis*), buddleja (occasional), bramble, travellers joy (*Clematis vitalba*), common knapweed (*Centuarea nigra*), dandelion (*Taraxacum officinale*), nettle (*Urtica dioica*), meadow buttercup (*Ranunculus acris*), cocksfoot (*Dactylis glomerata*), false oat grass (*Arrhenatherum elatius*), yorkshire fog (*Holcus lanatus*) & wild carrot (*Daucus carota*). In damper margins adjacent to the river water pepper, water horsetail, marsh woundwort, meadowsweet (*Filipendula ulmaria*) and marsh willowherb (*Epilobium palustre*) are present. Other habitats within this area include amenity grassland (GA2), improved agricultural grassland (GA1), hedgerow (WL1) and buildings and artificial surfaces (BL3). Mature treelines (WL2) are present along this stretch of the river, on the east bank of the river consisting predominantly of ash with sally willow, blackthorn (*Prunus spinosa*) and immature sycamore, with a scrub understory of bramble, American willowherb (occasional) and nettle, and bordering Commons Inn site (to the North West), with sessile oak (*Quercus petraea*) sally willow & aspen (*Populus tremula*).

Section 2: Common's Inn to Fitz's Boreen

Downstream of Commons Inn, the river flows through a series of operational and derelict industrial areas and is typically retained by flood walls. Riparian species here are more typical of wasteground, such as buddleja and catsear (*Hypochaeris radicata*). Small patches of reed canary grass and water dropwort (*Oenanthe crocata*) are also present.

Further downstream habitats adjacent to the Bride (North) within the works area include recreational parkland including scattered trees and amenity grassland categorised as scattered trees and parkland (WD5). A small section of mixed broadleaved woodland (WD1) is also present on the western bank of the river to the south of Common's Inn. The woodland is located on high ground and the main species include sally willow, downy birch (*Betula pubescens*), rowan (*Sorbus aucuparia*) and ash.

Scrub (WS1) is present on the eastern bank of the river. Narrow strips of dry meadow and grassy verge (GS2) with nettle, reed canary grass, American willowherb and meadowsweet, water pepper (*Persicaria hydropiper*), marsh woundwort (*Stachys palustris*) and water horsetail (*Equisetum fluviatile*), and mature treelines (WL2) of sally willow and alder (*Alnus glutinosa*) are also present along the river within this section.

Section 3: Fitz's Boreen to Blackpool Retail Park

This section of the Bride (North) is heavily industrialised and flows through largely built areas categorised as buildings and artificial surfaces (BL3). A narrow strip of dry meadow and grassy verge (GS2) is present on the river margin of the eastern bank which is bordered by flood walls. Species include nettle, reed canary grass, American willowherb and meadowsweet. Short treelines (WL2) of sally willow and alder are also present along the river banks within this section on the eastern and western banks of the channel. A Japanese knotweed stand (approx 10m long) is present along the treeline on the eastern bank of the river close to Sunbeam Industrial Estate.

The Bride (North) downstream of the culvert at Millfield Industrial Estate flows through an area of scattered trees and parkland (WD5) and amenity grassland (GA2). Narrow strips of amenity grassland within the vicinity of Blackpool Retail Park are interspersed with planted areas of Flower beds and borders (BC4) and ornamental non-native shrub (WS3) along the river banks.

Section 4: Blackpool Retail Park to Watercourse Road

Downstream of Blackpool retail park the river side habitats consist of mature dense Treelines (WL2) of sally willow, sycamore with ash, alder and occasional cherry laurel, beech, oak, white willow, lime and downy birch, an area of mown Amenity grassland (GA2), Scattered trees and parkland (WD5) and buildings and artificial surfaces (BL3). Large stands of Japanese knotweed are present along both banks of the river in Orchard Court, close to where the river is culverted underground. The river between Orchard Court and Watercourse Road where the works are located is all culverted underground. This area is largely built land categorised as buildings and artificial surfaces. (BL3)

5.3.1.2 Glenamought River

The Glenamought is a less modified river than the Bride (North), flowing through rural areas for much of its length. The river downstream of the Glenamought viaduct on the Mallow Road, where the proposed works are located flows through an area of Mixed broadleaved woodland (WD1), Amenity grassland (GA2) and built land categorised as buildings and artificial surfaces (BL3). The mixed broadleaved woodland consists of a large area alongside the river on the elevated northern bank and is dominated by mature wych elm,

ash, sycamore and cherry laurel close to the river margins. The areas of maintained amenity grassland are associated with private dwellings and business parks. Mature Treelines (WL2) consisting of beech, alder, sycamore and ash are present on both banks of the river close to its confluence with the Bride (North) near the Mallow Road. The river is heavily shaded in parts from species including beech (*Fagus sylvatica*), sycamore, hawthorn, horse chesnut (*Aesculus hippocastanum*), willow (*Salix* spp.), buddleja, Cherry laurel (*Prunus laurocerasus*).

A 100m (approx. length) strip of invasive Japanese knotweed also present along the southern bank of the river in an area of amenity grassland.

The full list of habitats within the study area and the works which lie in close proximity to these habitats are listed below. For information on the works refer to Drawings in Appendix 3A, listed in Table 5.4 below.

Table 5.4 List of habitats within the study area and works in proximity to these habitats

Habitat	Fossitt Code	Works in close proximity to habitat (refer to Appendix 3A drawings for works details and locations)
Treelines	WL2	C14_B01, C14_B02, C12-E01, C23_L03, C12_L03, C12_L06, C12_L17, C12_L18, C12_B02
Hedgerow	WL1	
Scattered trees and parkland	WD5	C12-E01
Mixed broadleaved woodland	WD1	C12-G01
Scrub	WS1	C12-G01
Dry meadow and grassy verge	GS2	C12_L03, C12_C01, C12_L10, C12_L13, C12_L17, C12_C03
Amenity grassland	GA2	C14-E01, C14-B02, C12-E01, C12_E02, C12_L21, C12_L22, C12_LL23, C12_B02
Agricultural grassland	GA1	
Flower beds and borders	BC4	C12_L21, C12_L22, C12_LL23
Ornamental non-native shrub	WS3	C12_L21, C12_L22, C12_LL23
Buildings and artificial surfaces	BL3	All
Lowland Depositing River	FW2	All, C12-G01(instream), C12_C02 (instream), C12_C03 (instream), C12_C01 (instream), C12_B02

A number of non-native species are present along the Bride (North), including montbretia (*Crocsmia x crocosmiiflora*), snowberry (*Symphoricarpos albus*) and the highly invasive Japanese Knotweed. The locations of a number of these species are described in greater detail in Section 5.3.1 below.

No Annex II listed plant species or Flora Protection Order (FPO) species were recorded during the field surveys.

5.3.1.3 Floating River Vegetation

Floating River Vegetation (FRV) habitat is widely distributed throughout the River Lee from Inniscarra Dam to Cork City. Smaller more localised stands of *Ranunculus* sp. with very low cover, *Fontanalis* moss with low cover and *Calitriche* sp. with low cover were present on the River Bride (North) and the Glenamought River. No pondweeds were recorded. While these examples of FRV habitat exist, the percentage cover is low and therefore they are not considered good examples of the habitat. Along the middle reaches of the Bride (North), these stands of FRV alternate along the margins of the river. At Oldcourt, where the river is to be culverted the moss species *Fontinalis antipyretica* (more nutrient tolerant moss) occurs.

Within the Bride (North) and Glenamought rivers the Floating River Vegetation was not of Annex I habitat quality given the extent of fragmentation.

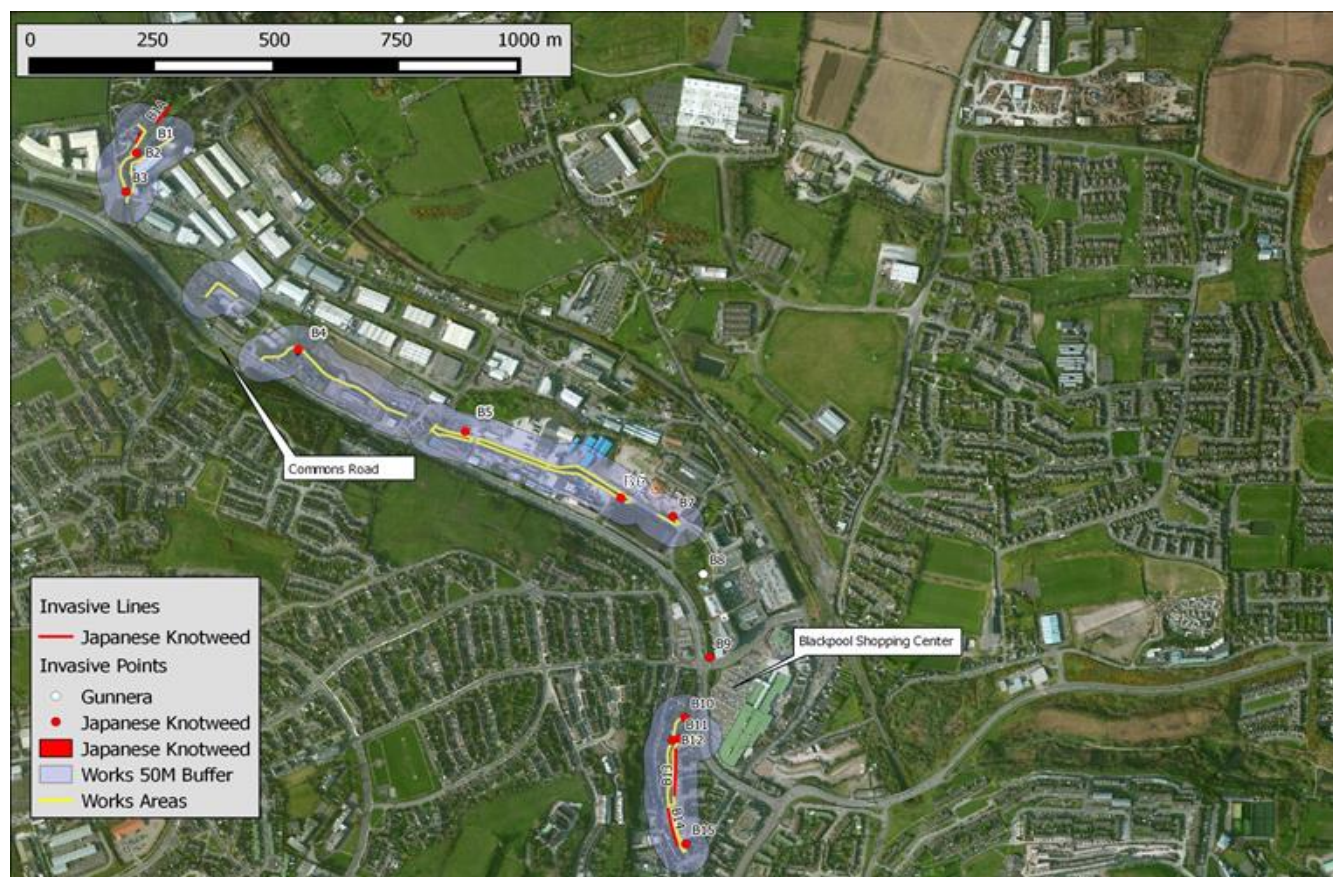
5.3.1.4 Invasive Plant Species

A targeted invasive plant species survey was carried out to establish the distribution of invasive plants within the footprint of the proposed works. The survey targeted the invasive species Japanese Knotweed (*Fallopia japonica*), Giant Hogweed (*Heracleum mantegazzianum*), Giant Rhubarb (*Gunnera tinctoria*) and Himalayan Balsam (*Impatiens glandulifera*).

Two invasive species, Japanese knotweed and giant rhubarb, were recorded in the works area for the Blackpool. 13 No. records for invasive species were documented along the Bride (North). Japanese knotweed accounted for 12 of the 13 No. records for invasive species recorded along the Bride (North) river channel. A single giant rhubarb plant was also present in the amenity park adjacent to Blackpool Retail Park.

Japanese Knotweed was the only invasive species recorded along the Glenamought River channel. It was recorded at four locations. The distribution of invasive species along the Bride River (North) and the Glenamought River is shown in Figure 5.2 below.

Fig 5.2: Map showing invasive species recorded with the proposed works areas along the River Bride (North) and Glenamought River, Blackpool, Cork City.



5.3.2 Significance of the Flora

The floating river vegetation within the study area is fragmented and occurs in low frequency. Although floating river vegetation further downstream on the River Lee corresponds to the Annex I Habitat 'Watercourses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation (3260)', floating river vegetation within the Rivers Bride (North) and Glenamought is fragmented, occurs in low frequency and does not have strong links with the Annex I habitat 'Watercourses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation (3260)'. The importance of this habitat within the works area lies predominantly in its association with salmonid fish and invertebrates as it acts as both a food source and a resting habitat.

Mature treelines, hedgerows and areas of scrub provide commuting and foraging corridors for mammals and bat species within in the area and nesting sites for bird species.

No protected plant species (Annex II, IV or FPO) were recorded at any of the locations during the field walkover survey.

The habitats most common and with low botanical significance are those which are either highly modified through agriculture, amenity or urbanization. These habitats include Built land (BL3) improved agricultural grassland (GA1) and Amenity grassland (GA2) located throughout the study area at various locations.

5.3.3 Fauna

5.3.3.1 Birds

All bird species seen or heard during the field surveys were recorded and are shown in Table 5.5. The bird species recorded were typical of the habitats found within the study area.

Kingfisher

A series of targeted kingfisher (*Alcedo atthis*) surveys were carried out on the Bride River (North) and Glenamought Rivers in order to identify the distribution of kingfishers in the catchment of the flood relief works in the Blackpool area and also to highlight any nesting areas if visible. The survey areas included sections of river channel overlapping the proposed works areas.

Bank walkover surveys were conducted to target areas where suitable nesting bank was located, along with areas containing appropriate riparian resting perches and good prey availability and which overlapped with proposed works areas along the relevant river channels.

Kingfisher was recorded along the Glenamought River, during a bank walkover survey, no kingfisher were identified in the Bride (North). On the Glenamought River one Kingfisher nest (recently active) was identified over 500m upstream of the commencement of the project (east of Kilnap Bridge). An active nest site was identified in a section of steep, relatively open bank composed of soft mud and clay situated amongst an area of riparian scrub (WS1) and mixed woodland (WD1). Two sightings of kingfisher was observed during walkover surveys flying upstream under the Glenamought Viaduct (at the commencement of the scheme) and upstream at Kilnap Bridge. No kingfisher records (i.e. sightings, feeding observations or nest sites) were obtained from the River Bride (North). The absence of multiple nesting sites can be explained by the lack of suitable bank sides for nest excavation along the rivers. Very little of the banks along the Glenamought were deemed suitable for nesting kingfisher and risk of predation was evident in the form of evidence of mink predation on existing nest sites. The failure to record kingfisher nests along the Bride (North) is reflective of no suitably composed or aligned bank in which to burrow and poor prey availability (the Bride (North) shows a low density of small fish which are preferred prey for Kingfisher).

Other bird species

No potential Dipper habitat was identified along the Bride (North) or the location of the proposed works on the River Glenamought.

No species listed on the Birds of Conservation Concern in Ireland (BoCCI) Red List were recorded during the field surveys.

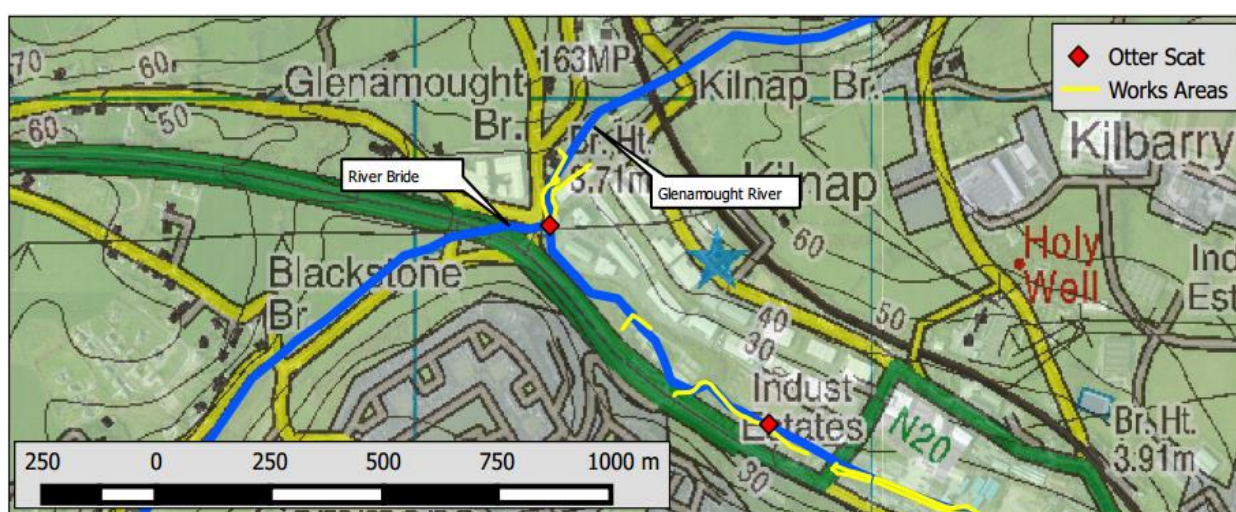
5.3.3.2 Mammals

The study area was searched for signs of mammal activity with dedicated surveys undertaken for Otter (*Lutra lutra*) and Bats. Potential badger (*Meles meles*) habitat was recorded in the Riparian woodland at the Glenamought Storage Area but no signs were recorded within the study area for the lower Glenamought or the Bride (North) river channels. Other species that are likely to occur in the area but were not recorded include Fox (*Vulpes vulpes*), Rat (*Rattus norvegicus*), Stoat (*Mustela erminea*), European Hedgehog (*Erinaceus europaeus*), Pygmy Shrew (*Sorex minutus*), and Brown Hare (*Lepus europaeus*).

Otter

The entire length of the River Lee and its first order tributaries offers suitable habitat for Otter (*Lutra lutra*) with ample vegetation for cover along the river banks and likely good fishing within the river. The River Lee and its 1st order tributaries within the city environs are also known to support a population of foraging/commuting Otters. Overall Otter records were more localised or absent in the tributaries of the River Lee, i.e. the Bride (North) and Glenamought, than in the River Lee main channel. Two records in the form of spraints were recorded from the River Bride (North) at Kilnap Bridge and behind the Common's Inn on the N20 (see Figure 5.3) and habitat in the upper Glenamought provides good holding opportunities but is outside the study area (see Appendix 5F for details of targeted Otter survey).

Figure 5.3 – Otter records from the River Bride (North) & tributary Glenamought River



Bats

During the walkover survey, potential habitat for foraging bats was recorded at the following locations: in Blackpool along the Bride (North) at Orchard Court and Common's Road, along the Glenamought River. No potential roosting habitat was identified.

5.3.3.3 Fish

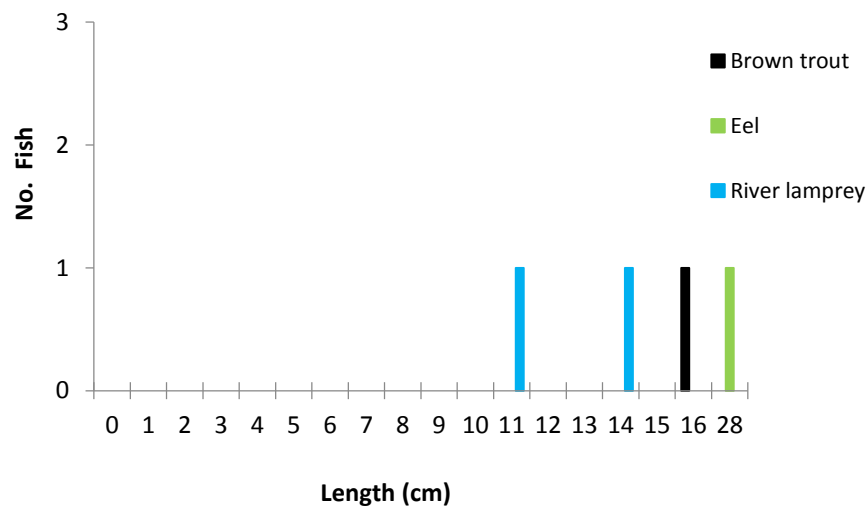
A number of fisheries surveys were undertaken on the River Lee and several of its tributaries, to assess the overall fisheries habitat value in the lower River Lee and selected tributaries (i.e. Bride (North) and Glenamought Rivers), particularly in relation to Annex II lamprey and salmonid species.

Electro-fishing surveys of the existing fish stocks at selected sites on the Bride (North) ($n=3$) and Glenamought ($n=1$), the results of the surveys outlined below.

River Bride (North) – u/s N20 culvert (site B1)

A low diversity and abundance of fish species was recorded from the River Bride (North) site upstream of the N20 culvert (overpass), with River lamprey transformers ($n=2$) and single examples of Brown trout and European eel captured from a low-flow site choked with *Apium nodiflorum* (>90% cover). A length-frequency plot for each species recorded is presented in Figure 5.4.

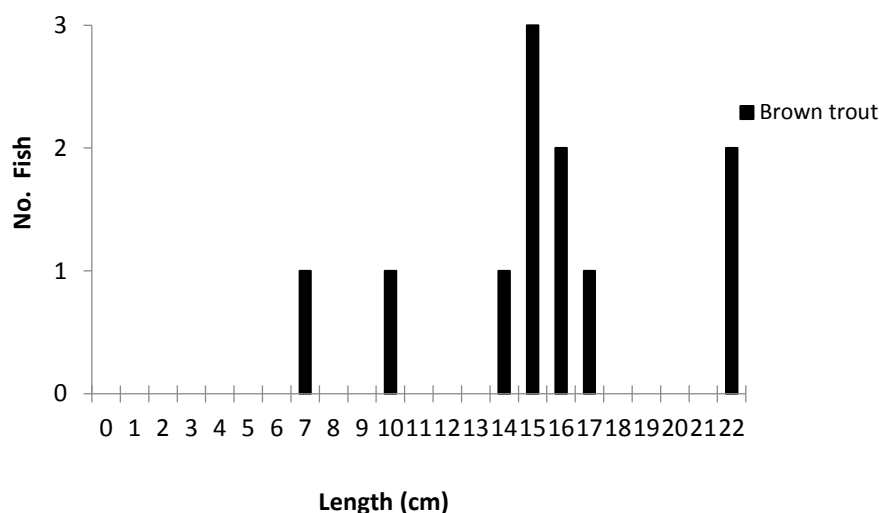
Fig 5.4: Length-frequency distribution plot for all fish species recorded at River Bride (North) – u/s N20 culvert (site B1) September 2014



River Bride (North) – Commons Inn (site B2)

The Bride (North) on the Commons Road becomes increasingly encroached by industrial development. However it maintains a semi-natural channel and the better quality water from upstream is likely to in maintaining some salmonid habitat. The Bride (North) site in the vicinity of the Commons Inn was found to hold a single species only, namely Brown trout ($n=11$). A length-frequency plot for the Brown trout recorded is presented in Figure 5.5.

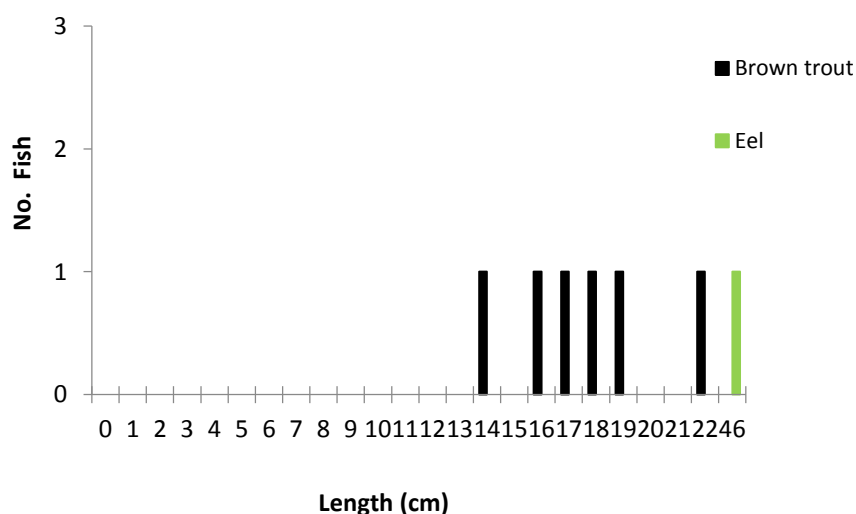
Fig. 5.5:- Length-frequency distribution plot for all fish species recorded at River Bride (North) Commons Inn (site B2) September 2014



River Bride (North) – Orchard Court, Blackpool (site B3)

Similar to the other surveyed sites on the Bride (North) at Orchard Court contained a low fish diversity. In this area the Bride (North) forms its last natural area of habitat before being heavily culverted in Blackpool. Brown trout were, again, the dominant species, although their abundance was relatively low ($n=6$). A single large European eel was also recorded. A length-frequency plot for both species recorded is presented in Figure 5.6.

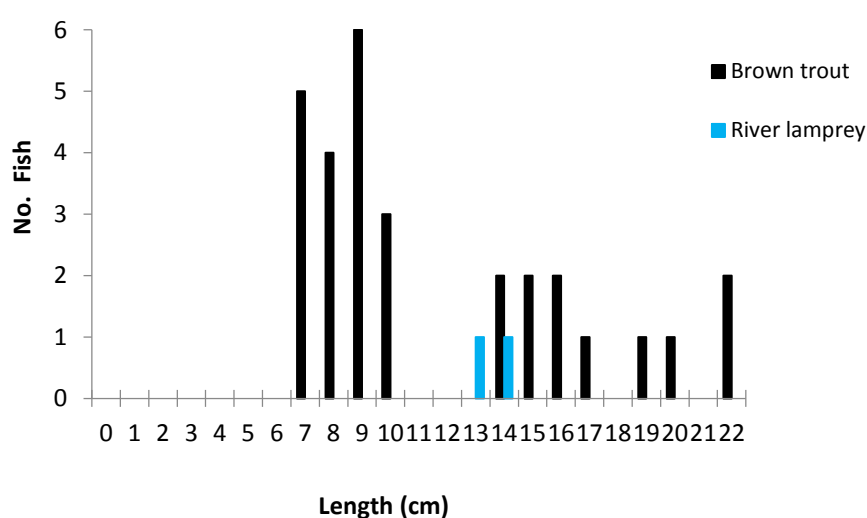
Fig 5.6:- Length-frequency distribution plot for all fish species recorded at River Bride (North) – Orchard Court (site B3) September 2014



Glenamought River – d/s Viaduct (site GL1)

Two species were recorded from the single surveyed site on the Glenamought River, a tributary of the River Bride (North). Brown trout were abundant at the site ($n=31$) and a wide range of size classes was present in the section characterised by a clean cobble substrate, riffle/glide system and a relatively high flow rate. Two River lamprey transformers were also recorded, indicating suitable lamprey spawning habitat upstream of the site. A length-frequency plot for both species recorded is presented in Figure 5.7.

Fig 5.7: Length-frequency distribution plot for all fish species recorded at Glenamought River – d/s Viaduct (site B4) September 2014



5.3.4 Significance of Fauna

River Lamprey, listed on Annex II of the EU Habitats Directive was recorded in low numbers in both the River Bride (North) and the Glenamought River.

Brown Trout was the most frequently recorded species throughout the Bride (North) and the Glenamought River. Although Brown Trout has no legal protection, it is an important indicator of the ecological status of stream health and remains important in an overall biodiversity, conservation and management context. Removal of Brown trout has consequences for a stream meeting 'good status' under the Water Framework Directive (2000/60/EC).

European eel was recorded in the Bride (North) in low numbers. European eel is critically endangered and has protective status under the European Eel Regulation EC No. 1100/2007 to facilitate the recovery of the eel stocks since a large decline in the 1980's.

In addition, the river and surrounding vegetation provide habitat for two further species that are protected under European legislation. These are Otter (Annex II, Habitats Directive) and Kingfisher (Annex I, Birds Directive). Kingfisher was recorded on the Glenamought River, whereas Otter was recorded along the Bride (North).

No evidence of Freshwater Pearl Mussel (Annex II, Habitats Directive) was recorded during the walkover surveys.

All bat species are protected under Annex IV of the EU Habitats Directive and are likely to use the area for foraging.

In addition to the above species, most of which are protected under European Legislation, the study area includes a wide diversity of aquatic and terrestrial habitats. The rivers provide suitable habitat for a range of aquatic species. The woodlands, tree lines and bank side vegetation provide cover and feeding areas for a wide range of mammal and birds.

5.4 IMPACTS AND MITIGATION MEASURES

5.4.1 Do nothing Scenario

In a do-nothing scenario it is likely that the current regime of management and maintenance on the river would continue with the nature of the river being maintained essentially as it is. It is likely that maintenance works would include the removal of debris and build-up of sediments in the town and around the bridges, along with bank protection works where necessary. It is likely that these works would be undertaken in consultation with the IFI to minimise impacts on fisheries.

5.4.2 Impact on Loss of Habitat

Slight to Moderate Negative Impact

5.4.2.1 Instream Habitats

The construction phase will involve works in channel and along the banks of the Bride (North), the Glen and the River Glenamought.

Temporary and permanent loss of instream habitat will result during construction of the works. In general the study area is of poor quality habitat although occasionally floating river vegetation is present (primarily adjacent Commons Road in small and fragmented sections). The floating river vegetation is poor in quality and quantity and is considered important not for its links to the Annexed I Habitat namely 'water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation' but as a habitat for resting and feeding brown trout.

There will be some loss of this habitat during construction of instream structures: culverts, bridges, winter channel and sediment traps. Construction of bridges will require flow diversions to allow for pier construction. However flow will be maintained at all times on one side of the river. Post construction river bed gravels will be reinstated at all bridge locations and any floating river vegetation will have opportunity to recover post construction.

Approximately 506m of culverts are proposed at 5 locations throughout the scheme. A 342m long section of reinforced concrete culvert downstream of Blackpool Bypass at Orchard Court and terminating under Old Commons Road to the north of the church is the most significant of these structures which will result in the loss of habitat during construction and in the long term. Additional habitat will be impacted as a result of the construction for 4 other culverts (See Chapter 3 for full details of proposed scheme). For all culverts there will be a requirement for flow diversions or over pumping. There will be limited loss of floating river vegetation habitat during construction of all culverts, with the most significant loss at the Orchard Court Culvert.

Sediment Traps are proposed at the upstream end of the Sunbeam Industrial Estate and upstream of Commons Inn Hotel at North Point Business Park. The sediment trap upstream of Commons Inn Hotel is provisional; the need for the trap will be based on post construction monitoring of the scheme and its functioning in the absence of a sediment trap at this location. At the Commons Inn the purpose of the trap is to naturalise and reconnect the floodplain at this location. Flood scalping and lowering of the inside channel bends along a gently meandering section of river channel have the potential to enhance natural sediment controls upstream of the sediment trap at Sunbeam. In addition to regrading ground levels, this sediment management feature may incorporate instream geomorphic features, such as riffles. The potential inclusion of this feature in the scheme will be subject to review following detailed geotechnical investigations, detailed design and at a later point during the scheme operation.

The sediment controls at Sunbeam will capture fluvial sediments (primarily small cobble sized material), help minimise the risk of large sediments settling downstream and within the Blackpool culvert system. This will affect the hydromorphology of the river by reducing sedimentation.

In addition to the above features, removal of sediment from the river channel will form a key part of the sediment management regime.

Floating River Vegetation is generally limited in extent, of poor quality and does not correspond to Annex 1 habitat. However the vegetation provides important shading and protection for brown trout. Impacts are slight negative on this habitat type.

Downstream of the Sunbeam Sediment Trap a 70m long culvert will be removed as part of the scheme. The removal of this culvert will afford the opportunity of new habitats to form in this area. This opportunity is limited however due to changes in hydromorphology from the upstream sediment trap and the proposed maintenance regime.

Construction of a Winter Channel is proposed on the Bride (North) where sharp bends contribute to elevated flood levels occurring along the Commons Road (N20). A winter channel will help with high flows by cutting a secondary flow route into the existing bank. In normal flow conditions the river will be confined to the main channel and the winter channel will be used only during periods of high flow. The existing main channel (low flow channel) will remain unaltered. There will be no permanent impact on the existing low flow channel with regard to habitats in this location.

Impacts may also arise as a result of silt release and pollution incidents during construction and during routine maintenance which could adversely impact on the river and its habitats, this could result in temporary decline in water quality, increased turbidity, fine sediment redistribution and nutrient enrichment.

The impact on habitats is considered **slight-moderate negative** due to both permanent and temporary loss of floating river vegetation habitat during construction and risk of habitat loss due to sediment and pollution events. Upon completion of works aquatic flora affected by the construction phase impacts will recolonise from upstream sources. Gravel beds will be reinstated at the locations of all four bridges and smaller culverts. There will be a permanent loss of habitat for approximately 342m. Sediment traps and roughing screens will result in reduced sediment and gravel availability resulting in changes to the morphology of the river channel down stream. There will be a potentially positive impact on habitat as a result of the removal of 70m of culvert and regrading of river bed at Sunbeam.

5.4.2.2 Terrestrial Habitat

Terrestrial works are largely confined to the Bride (North), Glen and Glenamought River banks and adjoining areas as well as temporary construction compounds and access routes. Amenity grassland (local importance (lower level) conservation interest) is common along the Glenamought River and the Bride (North) with occasional mature trees lines of Local (higher) level Importance conservation interest. A small area of mixed broadleaved woodland will be lost as a result of the construction of the winter channel (Local (higher) level Importance) while small areas of scrub (Local (higher) level) will also be lost.

Japanese knotweed is frequent along the length of the Bride (North) and within the footprint of the works. The majority of works proposed are located on artificial surfaces with occasional strips of grassy verge. A loss of treelines, woodland and scrub is considered to be the most significant impact on terrestrial habitat resulting in a **slight negative** permanent impact.

5.4.2.3 Mitigation Measures

- A Project Ecologist will be appointed for the duration of the works.
- The footprint of works will be identified at the onset and will be demarcated to avoid unnecessary disturbance to habitats outside the works area. Method Statements detailing the construction footprint and access routes to the proposed works will be approved prior to construction.
- Upon completion of the works channel vegetation will be allowed to recolonise naturally.
- Introduce spawning gravels at morphologically/hydraulically appropriate locations i.e. where removal of culvert is proposed
- Upon completion of the works the new embankment, and in any other grassland areas disturbed during the construction works, will be re-sown with an appropriate species rich grass and wildflower seed mix.
- Hedgerow/tree line planting will be undertaken to replace the length of hedgerow/treeline lost to accommodate the new flood embankment. Hedgerows will be replanted as close to the existing alignment and location as possible and will use native, locally sourced species.
- Works will only be undertaken during normal working hours (8:00am – 6:00pm).
- All works undertaken on the banks will be fully consolidated to prevent scour and run off of silt. Consolidation may include use of protective and biodegradable matting (coirmesh) on the banks and also the sowing of grass seed on bare soil.
- Appropriate mitigation measures will be implemented prior to the construction phase to ensure that water quality is not adversely affected through pollution incidents and silt mobilisation. This mitigation will include:
 - All material including oils, solvents and paints will be stored within temporary bunded areas or dedicated bunded containers;
 - Where possible refuelling will take place in a designated bunded area away from surface water gullies, drains and water bodies, in the event of refuelling outside of this area, fuel will be transported in a mobile double skinned tank;

- All machinery and plant used will be regularly maintained and serviced and will comply with appropriate standards to ensure that leakage of diesel, oil and lubricants is prevented.
- Spill kits and hydrocarbon absorbent packs will be available and drip trays will be used during refuelling;
- All relevant personnel will be fully trained in the use of this equipment;
- Where soil/made ground and subsoil stripping occurs, the resulting excavated soil fractions will be segregated into inert, non-hazardous and /or hazardous fractions (in accordance with Council Decision 2003/33/EC, the EPA water classification criteria at certain licensed landfills in Ireland);
- The excavation and handling of inert material will be carefully managed in such a way as to prevent any potential negative impact on the receiving water environment;
- Where possible the excavated spoil would not be stored beyond the working day, however in the event that this is not practical appropriate precautions in relation to the material will be taken. These precautions will include appropriate storage and covering;
- All associated hazardous construction waste will be stored within temporary bunded storage areas prior to removal by an appropriate EPA or Local Authority approved waste management contractor;
- The guidelines provided by the Department of the Marine and Natural Resources, with respect to concrete wash waters, CIRIA, the UK Environment Agency and Environment and Heritage Service, the UK Department of the Environment and Inland Fisheries Ireland will be adhered to in order to ensure that there is a neutral impact on the water environment during the construction phase of the proposed development.
- All cofferdams, or other structure installed within the river channel, to allow working in dry conditions must be designed by a competent person, be constructed of appropriate materials and take account of site conditions (i.e. depth of water, available space, bed substrate, flow velocities, flow patterns, duration of works, accessibility and potential ingress of water). During any working with cofferdams the following will be adhered to:
 - The cofferdam will be inspected daily for any movement, leakage and general deterioration; any defects found will be remedied immediately.
 - The working area will not be de-watered directly into the river; the removed water must receive treatment before discharge.
 - Before removal of the cofferdam at completion of the works all materials, debris, tools, plant and equipment will be removed from the work area and any potential sources of pollution/contamination within the cofferdam will be cleaned up.
 - The de-watered area will be re-watered before the cofferdam is removed to avoid the sudden ingress of water which may cause erosion of the replaced substrate.
 - When re-watering is undertaken, the pump inlets will be screened appropriately to prevent the intake of fish or other aquatic animals.

- During all works the weather forecast will be monitored and a contingency plan developed to prevent damage or pollution during extreme weather and high flow events.

5.4.2.4 Residual Impact

Permanent Slight – Moderate Negative Impact

The proposed mitigation will ensure that habitat diversity is maintained as much as possible within the channel and adjoining terrestrial habitat, however there is unavoidable loss of habitats of conservation interest namely floating river vegetation. While a permanent loss of habitat is anticipated, the quality and quantity is low. The residual impact is therefore remains as Permanent Slight- Moderate Negative Impact.

5.4.3 Impact on Floral Species

Permanent Slight Negative Impact

No protected flora, rare or flora of conservation interest have been identified within the study area, therefore impact on flora is considered negligible.

5.4.3.1 Invasive Species

Construction activities in areas infested with non-native invasive species have the potential result in their spread to locations previously un-infested. The Japanese Knotweed stands recorded on the Glenamought River and in several locations along the Bride (North) within the footprint of the works. Consequently this species could be spread should appropriate measures not be followed; this could have a negative impact, if the plant is transferred to a habitat of high ecological value.

5.4.3.2 Mitigation

- A survey will be carried out to map the extent of invasive species and an Invasive Species Management Plan will be put in place prior to commencement of construction.
- An eradication programme will be put in place which will also prevent spread during construction.
- Treatment / monitoring will be carried out for a minimum of 3 years.
- Treatment will be carried out by a suitably qualified person and will involve the use of herbicides approved for working in proximity to an aquatic environment.
- A bio-security protocol will be put in place during the construction phase of the development. This will ensure that all plant machinery and equipment will be thoroughly cleaned and inspected for any fragments of knotweed prior to leaving site.
- All construction staff will receive training in the identification and management of the invasive species, including identification of knotweed rhizomes, to verify the clearance of any area.

5.4.3.3 Residual Impact

Permanent Neutral Impact

With proper mitigation in place for the control and eradication of Japanese knotweed in place, there is a significantly reduced risk of spread of the plant to sensitive environments and there will be eradication of Japanese Knotweed locally. The impact on flora is therefore reclassified as Permanent Neutral Impact.

5.4.4 Impact on Fauna

Terrestrial Animals

Permanent Slight Negative Impact

There will be a potential impact on mammals and birds as a result of the proposal and during the construction phase in particular otter, bats and kingfisher.

5.4.4.1 Otter

Otter are known to forage along the Bride (North) and Glenamought River. Spraints were identified in vicinity of Kilnap Bridge and at Commons Inn and Blackstone Bridge. There is potential impact on otters using the study area for prey. It is most likely that otters using the Bride (North) are moving upstream for foraging only and are part of the River Lee otter population. No otters holts were identified within the study area and will not be impacted by the proposed works. Construction works have the potential to result in disturbance to otters, however there are no resting or breeding sites identified within the study area and works will be largely carried out during daylight hours thus minimising disturbance to nocturnal feeding activity. Culverting of approximately 503m of watercourse, introduction of sediment traps and other hard engineering will result in the loss of habitat and consequently the loss of prey items for otters. Given the limited prey availability currently found on the Bride (North) and the extensive territory covered by otters the impact on otters is considered as a slight negative impact.

5.4.4.2 Otter Mitigation

- See also mitigation measures for protection of habitats (Section 5.4.2)
- Night-time working be restricted to emergency works only.
- To minimise the potential for Otters becoming trapped, all excavations will be left open for the minimum possible time, and not over-night. If excavations have to be left open over-night they will either be covered securely or fitted with an escape ramp (no more than 45°) to allow accidentally trapped animals to escape. Materials to cover excavations or create escape ramps will be on site at all times so that all excavation areas can be made safe before leaving site.

5.4.4.3 Kingfisher

No nesting kingfisher were found in proximity to the works. Foraging kingfisher were observed in proximity to the works at Glenamought River however these birds are unlikely to be significantly disturbed during construction. Works at the Glenamought River consist of the construction of a roughing screen, flood defence embankments, access road improvement works, and two bridge replacements. Potential impacts are limited to disturbance to foraging habits, loss of instream foraging habitat or impact on water quality and therefore prey item impacts. The closest suitable nesting sites are over 500m upstream of the works and therefore disturbance to breeding sites is not considered significant.

In the absence of mitigation impacts on Kingfisher are considered Slight Negative/ Neutral Impact.

5.4.4.4 Other Birds

The impact of the proposed works on the overwintering water bird population which Cork Harbour supports is discussed as part of the Screening for Appropriate Assessment. This section considers impacts on the wider bird population within the study area, including breeding bird populations and non-waterbird populations

in winter. By the nature of the construction works involved in this scheme, a degree of disturbance to birds present in the vicinity of the works areas is inevitable. The magnitude of this impact, however, depends on a number of characteristics of the works, including:

- The timing of the construction activities
- The level of disturbance, both spatially and temporally
- The availability of equivalent habitats outside of the influence of disturbance to accommodate displaced birds.

The works proposed in this scheme will be conducted in relatively localised areas where levels of disturbance are already relatively high as result of its urban location. This, in combination with the substantial amounts of similar habitats outside the likely zone of influence, should minimise the potential for long-term population impacts from disturbance throughout the construction phases.

The removal of vegetation, hedgerows, treelines and woodland required prior to construction has the potential to impact on nesting birds. Impact on nesting birds in the absence of mitigation is Slight Negative Impact.

5.4.4.5 Birds Mitigation

- See also mitigation measures for protection of habitats (Section 5.4.2)
- All vegetation clearance works and site preparatory works will be conducted outside of the bird nesting season (March to September inclusive). If this is not possible, a breeding bird survey will be undertaken in advance of the works to ensure that there will be no impacts on nesting birds. If nests are found, they will be safeguarded, with an appropriate buffer, until the chicks have successfully fledged.
- Hedgerow /treeline planting will be undertaken to replace the length of hedgerow/treeline lost. Hedgerows/treeline will be replanted as close to the existing alignment and location as possible and will use native, locally sourced species appropriate to the locality.

5.4.4.6 Bats

Bats are not expected to use the study area in significant numbers. However it is expected that bats would be found in low densities in the Blackpool area. There are no potential bats roosts in existing bridge or culvert structure along the Bride (North) and Glenamought River. There is no bat roosting potential along the existing flood protection walls in Blackpool. There is potential roosting opportunity for bats in mature trees along the length of the scheme although none were identified as part of the survey. There is potential impact for loss of bats roosting in mature trees as a result of the scheme. In addition all treelines, woodland and scrub is likely to provide commuting or forging habitat for bats. The potential impact of site clearance on bats is considered slight negative.

5.4.4.7 Bats Mitigation

- See also mitigation measures for protection of habitats (Section 5.4.2)
- Outside of emergency works, there will be no night working during the construction phase.

- Any new lighting required as part of the project will be of as low a wattage as possible and will be directed away from the surface of the water.
- Prior to the commencement of site clearance, tree surveys will be carried out on trees identified as potential for bat roosts. If roosts are found or their potential cannot be ruled out, an appropriate mitigation strategy will need to be devised and a derogation licence will need to be applied for from NPWS.
- Removal of trees with bat roost potential will be carried out in September/ October and under the supervision of a bat ecologist.
- A Bat box scheme will be put in place to mitigate for loss of trees and suitable foraging habitat for bats. Approximately 4 bat boxes will be provided for on stone walls faces or mature trees (as deemed appropriate). Bat boxes will be woodcrete bat boxes such as those manufactured by Schwelger and will be put in place as per the recommendations identified in NPWS Irish Wildlife Manual (2006) Bat Mitigation Guidelines for Ireland.

5.4.4.8 Residual Impacts on Terrestrial Fauna

Permanent Slight negative / neutral impact

With mitigation measures in place there is no risk significant risk to bats, birds, otter or other mammal populations with the study area. Loss of foraging habitat and prey species will result in some loss of species using the area.

5.4.5 Impact on Fisheries

Permanent Significant Negative Impact

The habitat suitability and water quality is generally poor along the River Bride (North) for fish species. However Brown trout nursery and holding habitat is generally good to moderate although spawning substrata has been degraded due to siltation. Brown trout are the most common fish found here in relatively low abundance with occasional lamprey and eel. The most significant populations of Brown trout is within the Glenamought D/S of the viaduct where trout are abundant. Salmon are not known in the Bride (North) as their movement is significantly impeded by the culverting of the lower Bride (North) from Watercourse Road to its outfall to the River Lee.

During construction phase works will be required within the channel for bridge replacement and culvert construction, culvert removal and construction of sediment traps and winter channels. These works can potentially result in disturbance including noise, visual and vibrations which would displace fish from the works area and result in a temporary impediment to fish passage along the Bride (North) and Glenamought rivers. There is also potential for direct fish mortalities as a result of in-channel works, though entrapment over pumping etc. for stream diversions during works. Should in channel works be carried out during spawning then the impact may be particularly severe and while any disturbance impact will be temporary it can potentially result in reduction in spawning success and result in loss of a year class. The magnitude of the impacts due to construction activities is considered to be low resulting in a minor negative impact.

In addition to disturbance impacts, the construction works may directly impact upon fish habitats within the river, including areas identified as potential spawning habitat. In particular there is risk to habitat on the lower reaches of the Glenamought River where two bridges will be constructed. All other in channel works are located outside of those areas identified as good fisheries habitat. The majority of instream works will be concentrated at the River Bride (North) which is identified as being of poor fisheries quality.

Instream works on the Bride (North) will have a significant impact on brown trout during the construction and operational phase (albeit in low numbers). Construction of a 503m length of culvert will result in the permanent loss of habitat at these locations.

Sediment Traps are proposed upstream end of the Sunbeam Industrial Estate and upstream of Commons Inn Hotel at North Point Business Park. At the Commons Inn flood scalping and lowering of the inside channel bends along a gently meandering section of river channel have the potential to enhance natural sediment controls upstream of the sediment trap at Sunbeam. In addition to regrading ground levels, this sediment management feature may incorporate instream geomorphic features, such as riffles.

The sediment controls upstream of Commons Inn, which have been included in the scheme on a provisional basis, have the potential to enhance natural sediment controls at this location and over the stretch of river downstream to the sediment trap at Sunbeam (a total length of 1,160km) and promote more diverse channel morphology as a result. The effects on channel morphology could alternatively prove negative, the outcome being largely dependent on the detailed design of the features and the sediment management following construction. The impact on fisheries due to the proposed sediment trap are dependent on a design that will ensure fisheries habitat is maintained or improved.

The sediment controls at Sunbeam will capture fluvial sediments (primarily small cobble sized material), help minimise the risk of large sediments settling downstream and within the Blackpool culvert system. This will affect the hydromorphology of the river by reducing sedimentation. In addition to the above features, removal of sediment from the river channel will form a key part of the sediment management regime.

The sediment controls will affect the hydromorphology of the river most significantly between the sediment trap and the existing culvert at Old Commons Road, limiting sediment deposition over a distance of approximately 1 km incorporating culverts and open channel. The currently engineered existing river channel through Blackpool Retail Park currently displays patterns of natural sedimentation, with typically 40% riffle, 40% glide and 20% pool. The river has moderate nursery habitat and moderate spawning habitat. The riverbed at this location suffers from moderate siltation. The changes to morphology of the river bed has therefore the potential to result in a Permanent significant negative impact on fisheries.

To the north of Sunbeam Industrial Estate, the proposed removal of a 70m long culvert and instream rehabilitation works will be carried out. The removal of this works will result in a positive impact for fisheries locally.

A very low density of lamprey transformers have been identified within the study area given the significant impact of existing culverting of the Bride (North) between the River Lee and Watercourse Road. However the presence of River Lamprey demonstrates that unlike salmon they can bypass the Blackpool culvert which under low flow conditions is very shallow. Similarly for brown trout there will be loss of habitat as a result of the works on lamprey, in addition the provision of a newly culverted section of the river at Old Commons Road will potentially result in the River Bride (North) becoming impassable by lamprey.

As for Lamprey, European eel have been found in very low densities along the Bride (North). This is due to significant impediments of movement of migratory fish in the extensively culverted sections of the river. There will be an extension to the sterilisation of these habitats with the extension of culverting of the Bride (North) potentially resulting in the Permanent exclusion of European eel to the River Bride (North).

Construction impacts may also arise on the fish populations through silt mobilisation and pollution incidents which could impact upon water quality, turbidity levels and could also result in the smothering of spawning

gravels. Declines in water quality and the smothering of spawning gravels could potentially impact upon the ability of fish populations to survive within the river over the short to medium term.

The impact of the works on fisheries overall is a **Permanent Significant Negative Impact**.

5.4.5.1 Fisheries Mitigation

- See also mitigation measures for protection of habitats (Section 5.4.2).
- All works will be carried out in consultation with Inland Fisheries Ireland, in particular the design of a sediment trap upstream of Commons Inn Hotel (if required) will be designed in consultation with IFI.
- In channel working will be minimised, where possible, method statements will identify access routes and works areas prior to commencement in consultation with the Project Ecologist.
- In-channel working during the salmonid spawning season will not be permitted (November to March inclusive).
- During the construction phase, fish passage will be maintained in areas of in-channel working.
- Any pumps used for over-pumping must be 'fish-friendly' and fitted with appropriate screens.
- Avoid working in areas identified as being suitable for fish spawning, where practicable.
- The removal of the culvert near Sunbeam will include the regrading of the river to ensure removal of the existing weirs.
- Works will introduce spawning gravels upstream of Sunbeam Industrial Estate where culvert is to be removed (assuming morphologically/hydraulically conditions are appropriate).
- The winter channel will be constructed as such that there is no risk of fish being retained in the channel as flood water subsides. This will be ensured out by appropriate grading of the channel.
- Ensure that the proposed trash screens has an appropriate mesh size to allow for movement of salmonid species and that culverts and trash screen are designed and installed in line with published best practice (e.g. Armstrong et al 2010; Turnpenny & O'Keefe 2005).
- Compensation measures for permanent loss of riverine habitat will be carried out in an area upstream of the works are or in another aquatic environment. Compensation measures to be carried out will be in agreement with Inland Fisheries Ireland.

5.4.5.2 Residual Impact

Permanent Significant Negative Impact

Mitigation measures will minimise the impact on fisheries from the construction phase, however the permanent loss of habitat cannot be mitigated in the context of this assessment. Compensatory measures will be carried out in agreement with IFI with regard to salmonid habitat. However impact on Fisheries within the Bride (North) catchment remains a Permanent Significant Negative Impact.