



# **River Mall (Templemore) Drainage Scheme**

## **Environmental Impact Statement**

### **Volume 2**

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**TOBIN CONSULTING ENGINEERS**



# REPORT

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**PROJECT:**

**River Mall (Templemore) Drainage Scheme**

**CLIENT:**

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# 1 INTRODUCTION

## 1.1 General

This Environmental Impact Statement (EIS) has been prepared by TOBIN Consulting Engineers on behalf of the Office of Public Works (OPW) for proposed flood relief works on the Mall River in Templemore Town, County Tipperary.

The town of Templemore, County Tipperary, lies on the Mall River, and has a long history of flooding, with a number of flood events having been reported over the last 150 years. The most significant floods over the last 50 years occurred in December 1968 and then more recently in November 2000, when approximately 40 properties were inundated.

The OPW was requested by Tipperary County Council to address the flooding problem in Templemore, and in response to this request, the Design Section (Flood Relief) of the OPW has undertaken pre-feasibility and feasibility studies which showed that a flood relief scheme was technically achievable and economically viable. The design of a flood relief scheme for Templemore has now been completed, which will protect the town up to the 1 in 100 year flood event. This EIS aims to assess the impacts of this scheme on a broad range of parameters detailed.

The proposed scheme diverts the Mall River at Templemore Town through a long diversion channel approximately 805m in length that begins in Shortt's Field and finishes approximately 230m downstream of Small's Bridge. The scheme consists of proposed works including river drainage works, flood embankments, culverts and channel maintenance works at a number of locations, which are:

- North of Templemore Town;
- Shortt's Field area;
- Small's Bridge area;
- Richmond Road area;
- Church Avenue area: and
- South of Templemore Town.

## 1.2 Site Location

The proposed scheme is located in Templemore Town, County Tipperary; refer to Figure 1-1. The site location from north to south of Templemore Town includes poorly drained agricultural farmland (which is part of the Mall River floodplain), the town of Templemore including roads and paved areas beside buildings, passing through into more improved farmland south of Templemore Town.

Templemore is located approximately 12km north of Thurles, and approximately 18km south of Roscrea. The area surrounding Templemore is relatively flat, ranging from approximately 115mOD to 122mOD. A mountain range which includes the Devilsbit, Kilduff, and Borrisnoe Mountains occurs to the northwest of Templemore Town, the closest of these mountains being Devilsbit Mountain (480m OD), which is located approximately 6km northwest of the town centre. The source of the Mall River, which drains a catchment area of approximately 22km<sup>2</sup>, is located on Devilsbit Mountain.

### 1.3 Environmental Impact Statement Structure

The consequences of any major development project are generally presented in the form of an Environmental Impact Statement (EIS). This EIS contains information on the scale and nature of the proposed flood relief works, a description of the existing environment, impact assessment of the proposed flood relief works, and mitigation measures to mitigate and/or reduce the impact on the receiving environment.

The structure and content of the EIS has been based on the following documents, as published by the Environmental Protection Agency:

- Guidelines on the information to be contained in Environmental Impact Statements (2002); and
- Advice Notes on Current Practice in the preparation of Environmental Impact Statements (2003).

The minimum information that must be contained in an EIS is specified in Part X of the Planning and Development Act, 2000 and Schedule 6 of the Planning and Development Regulations, 2001. The structure and content of this EIS has been based on the legislative requirements as set out in Part X of the Planning and Development Act, 2000 and Part 10 of the Planning and Development Regulations, 2001 and the guidance documents by the Environmental Protection Agency as outlined above.

The overall EIS is arranged in four volumes, as follows:

#### **Volume 1: Non-Technical Summary**

This document provides an overview and summary of the main EIS using non technical terminology and detail. It is a means for non-professionals to review the information included in the main EIS document. It is a stand-alone document and should offer a clear and concise summary of the existing environment, characteristics of the development and mitigation measures for the development.

#### **Volume 2: Main EIS** (This document)

To allow for ease of presentation and consistency when considering the various elements of the environment, a systematic structure will be adopted for the main body of the statement. This structure is

known as a “Grouped Format”. The structure is used for each particular environmental aspect, as given below.

Chapter 1 of the Main EIS provides an introduction and a brief background of the project, the legislative requirements under which the document is prepared, EIS consultation and scoping the layout of the EIS.

Chapter 2 provides a detailed description of the proposed flood relief works.

Chapter 3 provides a detailed assessment of alternative options considered taking into account the planning context and the existing environment.

Chapter 4 provides details of the planning and development context of the proposed flood relief works.

Chapters 5 to Chapter 16 inclusive deal with the following:

- Chapter 5 - Human Beings
- Chapter 6 - Terrestrial Ecology
- Chapter 7 - Aquatic Ecology
- Chapter 8 - Soils and Geology
- Chapter 9 - Water
- Chapter 10 - Noise and Vibration
- Chapter 11 - Air Quality and Climate Change
- Chapter 12 - Landscape and Visual Impact Assessment
- Chapter 13 - Material Assets / Traffic
- Chapter 14 - Cultural Heritage
- Chapter 15 - Interactions of the Foregoing
- Chapter 16 - Abbreviations

Each of the environmental criteria will be prepared using the following headings:

### ***Introduction***

This section will include a background to the assessment and will describe the study methodology in carrying out the assessment.

### ***Existing Environment***

In describing the receiving environment, an assessment is made of the context into which the proposed scheme will be located. This takes account of any other proposed and existing developments.

**Potential Impacts**

This section allows for a description of the specific, direct and indirect impacts, which the proposed scheme may have and taking into account mitigation measures. This is done with reference to Existing Environment and Characteristics of the Scheme, while also referring to the magnitude, duration, consequences and significance of the scheme during the operational phases.

**Mitigation Measures**

This includes a description of any remedial, or mitigation measures that are either practicable or reasonable having regard to the potential impacts.

**Volume 3: Appendices**

All supporting documentation and references, referred to in the EIS text body (Volume 2) are included in this volume.

**Volume 4: Photomontages**

Photomontages are presented in Volume 4 of the EIS.

## 1.4 Scoping of the Environmental Impact Assessment

The scoping of the Environmental Impact Assessment (EIA) is a process of characterising the broad setting of the development, identifying the key impacts to be addressed and setting the boundaries of the EIA.

As part of the scoping process, a Public Information Day was held in Templemore on the 28<sup>th</sup> March 2014 to inform the local population and general public about the project.

## 1.5 Consultation

In accordance with Section 4 of the Advice Notes on Current Practice (in the preparation of Environmental Impact Statements (EPA, 2003)), the consultation process consisted of consultation with competent bodies, statutory bodies and interested parties. The primary objective of involving competent bodies, statutory bodies and interested parties at an early stage in the process is to aid scoping of the Environmental Impact Assessment.

Consultation letters were sent to the list of Consultees listed in Table 1-1 overleaf on the 4<sup>th</sup> June 2014. Responses were received from some of these Consultees and these are highlighted in the table. Copies of the full written correspondence received are included in Volume 3, Appendix 1.1. Comments received were considered and incorporated into the relevant sections of the EIS.

**Table 1-1 Consultation Responses**

Consultee	Summary of Consultee Response
An Garda Síochána	Dated 9 <sup>th</sup> June 2014 and 7 <sup>th</sup> July 2014. Acknowledgement of letter and no relevant information to submit and no issues to be addressed in EIS.
An Taisce	-
Bat Conservation Ireland	-
BirdWatch Ireland	-
Bord Gáis Networks	Dated 6 <sup>th</sup> June 2014. There is no Bord Gáis infrastructure in the Templemore vicinity.
Bus Éireann	Dated 9 <sup>th</sup> June 2014. Acknowledgement of letter and no issues of concern.
Coillte	-
Community & Enterprise Department of Tipperary County Council	-
Department of Agriculture, Food and Marine	Dated 9 <sup>th</sup> June 2014. Acknowledgement of letter and no issues of concern.
Department of Jobs, Enterprise and Innovation	-
Department of Transport, Tourism and Sport	-
Development Applications Unit – Department of Arts, Heritage and Gaeltacht	-
Department of Communications, Energy and Natural Resources	-
Department of Defence	Dated 19 <sup>th</sup> June 2014. No observations to make.
Department of Environment, Community and Local Government	-
Eircom	-
Electricity Supply Board	-
Environment Department Tipperary County Council	-
Environmental Protection Agency	-
Fáilte Ireland	-
Geological Survey of Ireland	-
Health and Safety Authority	-
Health Service Executive	The character, context, significance and sensitivity of the following should be addressed: noise & vibration impacts, water impacts, dust generation, impacts to local services and educational facilities, potential pest problems, waste generation and disposal, storage of chemicals and hazardous materials, impacts to access routes and securing the boundary of the development site.
Iarnród Éireann	Dated 26 <sup>th</sup> June 2014. The scheme passes beneath the Dublin to Cork Railway line. Any increase in depth or flow has potential to negatively affect the railway infrastructure and it must be demonstrated that works will not adversely affect the railway infrastructure and consequentially impact on railway safety. This is also the case with regards using adjacent lands as floodplains. It must be demonstrated that the scheme will not result in an increased risk of flooding to the railway line. The existing railway drainage systems must remain unaffected. Our ability to carry out any maintenance

Table 1-1 continued.

Consultee	Summary of Consultee Response
	works on the railway must not be affected at any time. The scheme should not introduce any protected species or environmental restrictions which would impact our ability to maintain/ or renew our assets.
Inland Fisheries Ireland	Dated 11 <sup>th</sup> June 2014. IFI state that in principle they support the proposal to establish a new river channel including the establishment of appropriate in-stream and riparian habitat. The detailed design of the new channel will be agreed in consultation with the IFI. No works shall be carried out without prior consultation and agreement with the IFI. The IFI welcome the development of proposals for linear parkland / river walks. IFI is of the view that the proposal should include a riparian zone of approximately 10m. IFI requires at least two weeks notification of the intention to divert the Mall River to the new channel. The diversion into the new channel can only take place during the period July to September inclusive.
Irish Farmers Association	-
Irish Peatland Conservation Council	-
Irish Raptors Study Group	Dated 23 <sup>rd</sup> June 2014. Acknowledgement of letter, no comments.
Irish Wildlife Trust	-
Local Enterprise Office Tipperary	-
Met Éireann	Dated 23 <sup>rd</sup> June 2014. The proposed scheme will not impact Met Éireann infrastructure.
National Park and Wildlife Services	-
National Roads Authority	Dated 9 <sup>th</sup> June 2014. Acknowledgement of letter. Dated 16 <sup>th</sup> June 2014. The Developer should consult with the relevant Local Authority / Regional Design Office. The Developer should assess impacts on the existing National roads. The EIS should identify the methods/ techniques proposed for traversing/ in close proximity to the national road network. The Developer is reminded to meet the requirements of all relevant legislation and guidelines. The Designers should determine if a Road Safety Audit is required.
Planning Department Tipperary County Council	-
Roads Department Tipperary County Council	Dated 16 <sup>th</sup> June 2014. Acknowledgement of letter. Further consultation was undertaken on the 7 <sup>th</sup> July 2014, in relation to future road schemes within the vicinity of the scheme, it has been confirmed by the Local Authority that no road schemes are proposed.
Shannon Development	-
Teagasc	-
Templemore and District Anglers	Dated 6 <sup>th</sup> June 2014. The group are in consultation with IFI on the project and are very willing to cooperate with the OPW. The main concerns area that the river should be managed and the works proposed should not affect the spawning of Salmon and Trout. Also the river should maintain a suitable Level of water to hold fish after the works have been completed including during summer months. It is also hoped that a suitable base for spawning fish is placed / returned to the proposed redirected site of the river.
Templemore Town Council	-
The Heritage Council	-
Water Department of Tipperary County Council	Dated 3 <sup>rd</sup> July 2014. Noted that there are important issues in relation to the wastewater, watermain and surface water networks along Church avenue.
Waterways Ireland	Dated 17 <sup>th</sup> June 2014. Acknowledgement of letter and no comments on scheme.

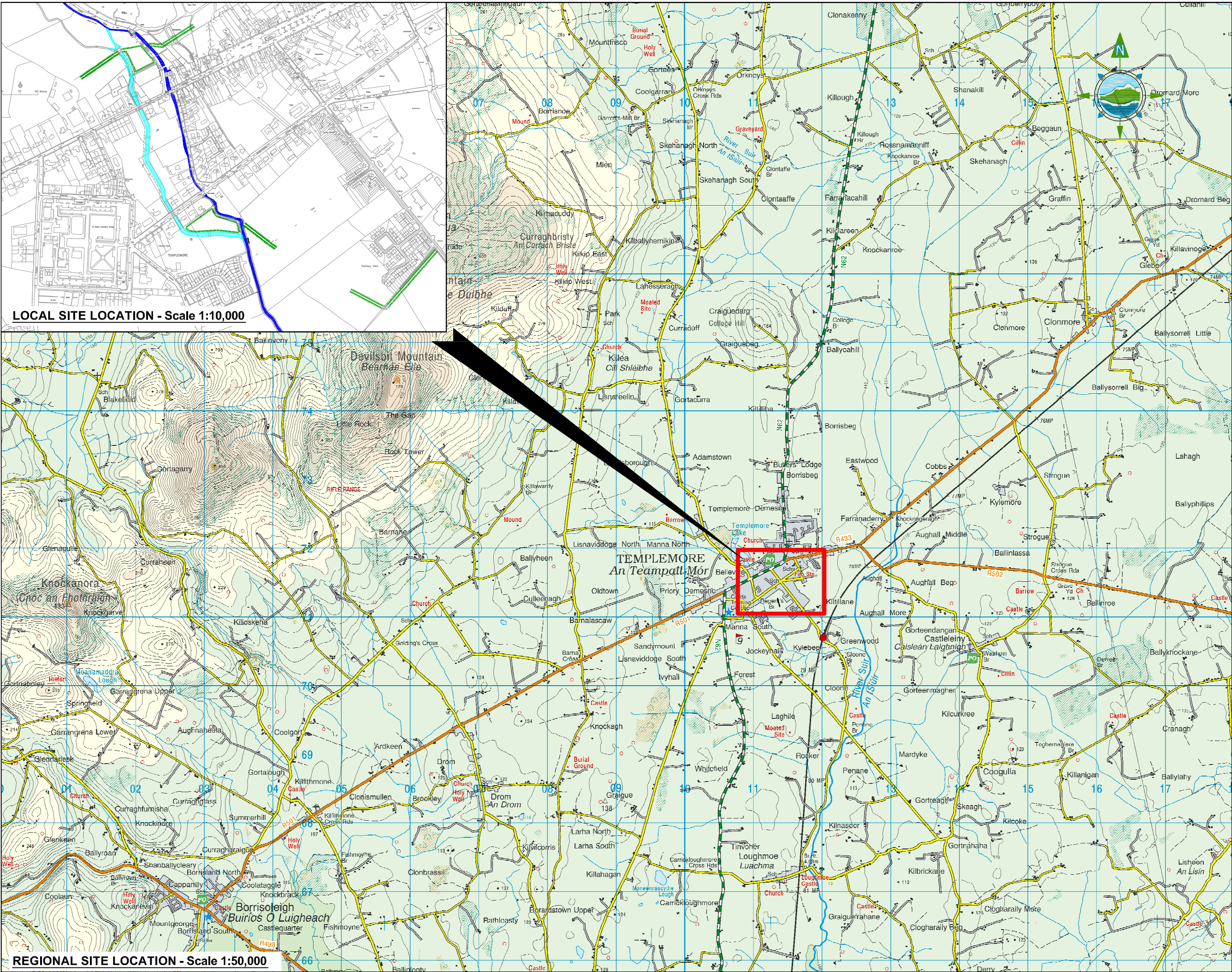
## 1.6 Study Team and Contributors to the EIA

This EIS has been prepared by a team of Consultants co-ordinated by TOBIN Consulting Engineers. The relevant inputs of the various members of the Project Team are listed in Table 1-2 below.

**Table 1-2 List of bodies involved in preparation of the EIS**

Team Member	Inputs
TOBIN Consulting Engineers	Project Direction, Project Management, Evaluation, Reporting and Production.  Introduction, Description of Development, Planning Context, Alternatives, Human Beings / Socio Economic, Terrestrial Ecology, Soils and Geology, Water, Air Quality and Climate Change, Material Assets and Traffic, Interaction of the Foregoing
URS	Landscape and Visual Impact Assessment
Moore Group	Cultural Heritage
ECOFAC	Aquatic Ecology (Mall River)
Allegro Acoustics	Noise and Vibration





THE INFORMATION ON THIS DRAWING  
IS TO THE ORDNANCE SURVEY IRELAND  
ITM COORDINATE SYSTEM

NOTES:

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING.
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE.
3. ENGINEER/EMPLOYERS REPRESENTATIVE, AS APPROPRIATE, TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES.
4. THE CONTRACTOR SHALL UNDERTAKE A THOROUGH CHECK FOR THE ACTUAL LOCATION OF ALL SERVICES/UTILITIES, ABOVE AND BELOW GROUND, BEFORE ANY WORK COMMENCES.
5. ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD.

Rev	Date	Description	By	Chk
A	03.02.15	FINAL ISSUE	MM	AA



Client:  
Project:  
Title:

TEMPLEMORE  
FLOOD RELIEF SCHEME

Scale @ A3: As Shown  
Prepared by: M. Nolan  
Checked: A. Austin  
Date: February 2015  
Project Director: D. Grehan  
Drawing Status: Draft



TOBIN Consulting Engineers  
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Drawing No.: Figure 1.1 A



## 2 EXISTING SITE AND PROPOSED DRAINAGE SCHEME

### 2.1 Description of Existing Site and Proposed Drainage Scheme

The proposed scheme is located in Templemore Town, County Tipperary, see Figure 1-1. The proposed scheme diverts the Mall River within the town through a long diversion channel approximately 805m in length that begins in Shortt's Field and finishes approximately 230m downstream of Small's Bridge, as detailed below and shown on Figures 2-1 and 2-2.

#### 2.1.1 Overview of Proposed Scheme

A 4m wide connector channel will start approximately 60m upstream of Shortt's Bridge and run directly south to the line of upstream defences in Shortt's Field (refer to Figure 2-1). A culvert is placed in-line with the flood defence embankment in Shortt's Field and the diversion channel route starts here with a bed level of 109.18m OD. The route will then proceed south-southeast for approximately 78m until it reaches the drain at Young's garage compound. It takes an easy bend (approximately 30 degrees) and heads directly south for approximately 40m to line up with the school yard boundary wall, where it returns to its original direction for approximately 50m to reach Richmond Road by cutting through the workshop of Hassett's garage (refer to Figure 2-1).

Its bed level is 108.48m OD as it crosses the road just west of two houses using a culvert with a 15m carriageway. It then maintains its line for 26m south of the road. To minimise land take, this stretch just north and south of the road has vertical sides 8.4m apart. It turns directly south for 172m and, as shown, a 4.5m-wide access bridge is required here to avoid land severance. It changes again to line-up just west of a line of electricity poles and follows their south-easterly direction for 120m to Church Avenue. The exact route depends on practicalities such as the electricity poles and hugging field boundaries to reduce land loss. Its route through these gardens and those to the south of the road has vertical sides 8.4m apart (to minimise land take). To reduce the cost of bridging the avenue's 13.5m carriageway, this route meets the road at right angles; its bed level here is 107.8m OD. The overflow from the chamber (just to the west) will be redirected to the diversion, just downstream of the culvert.

It then cuts through the private gardens on the south side of the road and curves to the southeast where it again needs a 4.5m-wide access bridge to avoid land severance (refer to Figure 2-1). It runs just over 190m to meet the river about 230m downstream of Small's Bridge, with a bed level of 107.33m OD. The intention is to align the channel as far as possible to the direction of the main channel. The opposite bank of the Mall to the outlet may have to be reinforced to protect it from erosion; this could be achieved using a placed stone revetment or gabions. This will also reduce reflected wave effects that could result in erosion to the bank further downstream.

### *2.1.2 Thalweg or Inset Fish Channel*

The excavated river and diversion channel could result in wide, shallow flow conditions unfavourable for fish. River excavation will inset a 0.3m deep, 2m wide Thalweg (the connected line of low-points that runs down along a channel with deeper water and faster flow during general flow conditions) to improve aeration and fish movement. This channel will be designed and constructed in consultation with Inland Fisheries Ireland and along the channel may be higher or lower and its width may vary.

### *2.1.3 The inlet to the Flood Diversion Route and Control Weir*

The 4m wide connector channel will start approximately 60m upstream of Shortt's Bridge and run directly south to the line of upstream defences in Shortt's Field (refer to Figure 2-1). At the upstream end, it will share the present riverbed level of 109.84m OD, however, at its downstream end, its bed level will be 0.5m higher than the diversion channel's level of 109.07m OD, as a consequence, a control weir is needed to protect this step-down in bed level. The weir will be approximately 0.75m in height. A fish pass will be installed in this area in consultation with the Inland Fisheries Ireland (IFI).

### *2.1.4 Dedicated Sediment (Gravel) Trap*

River gravel is a feature of the Mall River so a gravel trap will be required. A trap will be located in the area where the connector channel meets the defence embankment. This trap will be formed by gradually widening out the lower 20m of the connector channel to approximately 12m. Because a significant amount of flood flow will enter the diversion from the floodplains, this widened section will be protected by a wall that rises from the bed up to bank height. This wall will have two functions. Firstly it will act as a small weir for flood flows from the floodplains and secondly it will form the foundations of much of the Debris Trap.

### *2.1.5 Dedicated Debris Trap*

Debris, including flood debris such as tree branches or even whole trees, can reduce the efficiency of flood defence works therefore a dedicated debris trap will be installed at the downstream end of the connector channel to prevent this. This structure will mainly use the channel-side protection walls as foundations and comprise of three lines of approximately 2m high posts, set approximately 1.5m apart. The line along the left bank (east side of channel) will provide protection from debris carried by the wave of water that might result from a breach of the Town Park lake impoundment while the line along the right bank will protect against debris carried down the floodplain. The third line running diagonally within the debris trap will catch debris coming down the river.

### *2.1.6 Culverts*

The proposed scheme includes for a new culvert to be placed in-line with the new defence embankment in Shortt's Field. It also includes for culverts at Richmond Road, Church Avenue and four 4m carriageway, private access culverts; one in each of the areas of open land below the new bridges

and two (replacement) culverts over the Mall River below the diversion. These culverts will need to pass the full climate change flow of 21.63m<sup>3</sup>/s.

### 2.1.7 Upstream Defences

The town centre sits on the river's floodplain, so a flood defence line will run north of the town to shut off floodplain flows (refer to Figure 2-1). Embankments will have a rounded berm, with a 4m-wide crest and 1 in 5 side slopes on their open sides, but 1 in 3 (or less) where adjacent to a property boundary, if space is an issue. Landscaping can be employed to allow them better integrate with their surroundings.

An embankment (1.5m above ground level at most) will run approximately 150m from Blackcastle Road, through the river, to high ground to the south east of the lake in the Town Park. The primary function of the embankment will be to divert waters away from the town in case of a breach of the lake's impoundment (i.e. dam break).

A ramp will be constructed across Blackcastle Road to divert flood waters away from the town in case of a dam break. The exact location and slopes are a matter of road safety and will be finalised in detailed design stage. The building of this ramp will require the removal and rebuilding of road walls on either side; approximately 43m alongside Shortt's Field and approximately 66m on the riverside.

To close off flood defences at the upstream end of the town, an embankment (approximately 1.4m above ground level at most) is to be constructed to prevent flow from Shortt's Field entering Richmond Road. It will begin a little south of Shortt's Bridge and run 195m due west from Blackcastle Road to high ground (refer to Figure 2-1).

### 2.1.8 Downstream Defences

Just upstream of its re-entry point, a 90m long embankment will shut off the redundant river and tie into high ground to the east. Further east, the Railway View Estate will be defended by an embankment that runs approximately 110m along its southwest side and then turns and runs approximately 217m along the southeast and finishes at the road (refer to Figure 2-2).

The opposite river bank of the Mall to the outlet will have to be reinforced to protect it from erosion. This will be achieved using a placed stone revetment or gabions. This will also reduce reflected wave effects that could result in erosion to the bank further downstream.

Starting at the confluence (approximately 230m downstream of Small's Bridge) with a bed level of 107.3m OD, the riverbed will be re-profiled to finish at 106.1m OD 480m further downstream. The riverbed will be widened to 7.5m base-width from the diversion for approximately 450m and from there a transition returns to the existing 4.5m base wide over a further 250m (or so).

Channel maintenance is being designated from just upstream of the scheme works to where the Mall discharges to the Suir to prevent future growth of woody vegetation encroaching into the river or crowding-out the flowing floodplain.

### 2.1.9 Summary

To summarise, the proposed scheme involves:

- A 60m-long inlet channel with debris and gravel traps and a small drop weir.
- A new outflow from the town lake to run under Blackcastle Road to the inlet channel.
- A flood –defence line north of the town, in-line with a culvert over the new diversion.
- Relocating the river by constructing a new 805m long channel (with a 7.5m base-width) that begins in Shortt's Field and finishes approximately 230m downstream of Small's Bridge.
- The road and access bridges will need to pass the full Climate Change flow of 21.63m<sup>3</sup>/s.
- As the bypassed stretch of the river is no longer required, there are no residual flood risks from wall failure, etc and no need to sluice its drainage outlets.
- At Richmond Road and Church Avenue, separated by 8.4m, walls along both banks of the diversion both up- and downstream.
- Re-grading 480m of the channel from the new confluence to 740m below Small's Bridge. Over the same reach, widening the river to 7.5m and a further 250m from there to transition back to the existing 4.5m base width.
- A 90m-long embankment on the left bank (east side) below properties at Small's Br.
- A 320m-long embankment to defend the Railway View Estate area.
- To improve aeration and fish movement along the excavated river and diversion, a fish channel (Thalweg) will be dug and partially backfilled with gravels. While this will likely be about 0.3m deep with a 2m wide bed and up to 5 to 1 side slopes, it will be designed and constructed in consultation with the IFI and along the channel may be higher or lower and its width may vary.
- The channel from the upstream works to where the Mall discharges to the Suir is being designated for maintenance to prevent further growth of woody vegetation encroaching into the river or crowding –out the flowing floodplain.
- Impacts to the landscape will be reduced by using high quality finishes to works, grassed finishes to embankments and open channel sections, and by planting replacement and new vegetation; including in-channel, where possible.



**Figure – 2-1  
Upstream Defences  
and the River Diversion**



Figure 2-2 Downstream Works

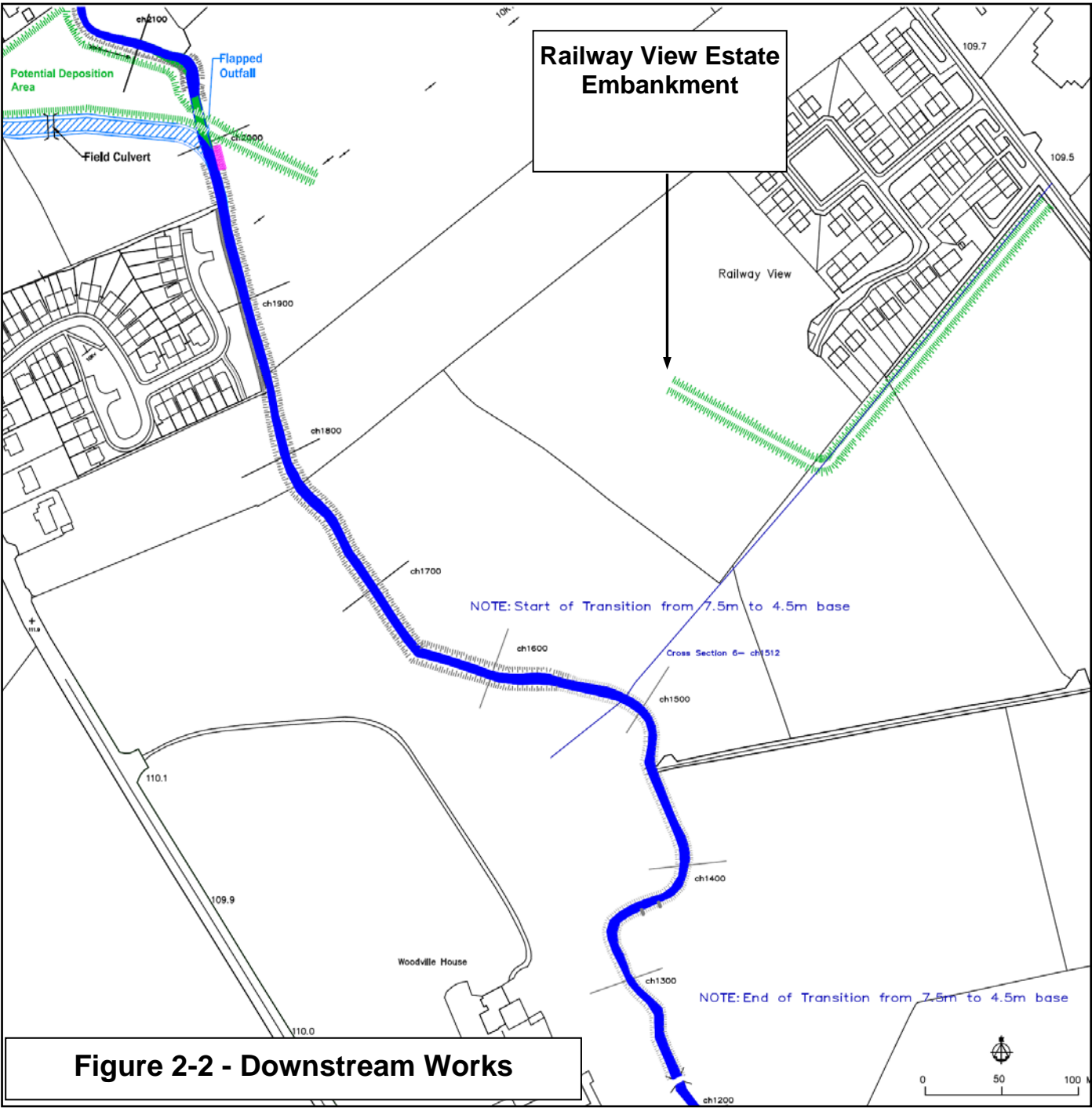


Figure 2-2 - Downstream Works

## 2.2 Hours of Operation

Construction work will be confined to the hours of 8am to 6pm, Monday to Friday and 8am to 12 noon on Saturday. Works will not be permitted outside of these hours. In some instances, approval to vary the prescribed hours may be sought based on the following considerations:

- Nature, location and extent of work to limit potential nuisance;
- Location of the site in relation to 'sensitive' zones;
- The urgency or emergency nature of the works;
- Safety requirements such as risk to the public/workers;
- Sequential/timing issues;
- Traffic management considerations;
- Noise reduction measures;
- Measures taken to address any potential complaints;
- Requirements of other authorities (e.g. ESB, Eircom); and
- Public interest.

## 2.3 Plant and Equipment Requirements

During the construction programme, the following plant and equipment will be required on site for use or contingency.

Plant Equipment	Activity
Excavators, rock breaking and piling attachments (for excavators), mobile crane, pumps, well pointing equipment (for dewatering if required), roller, compacting plates, mats (for excavators), lorries, low loader, dump trucks, dumpers, tractors and trailers, signage and traffic lights, hand held equipment and tools, scaffolding, shuttering and formwork, lighting, generators, cement mixers, power washers, fencing equipment, road saw, blawnax (for laying asphalt), road sweeper	Dredging works within Mall River. Bank grading works on Mall River. Ongoing stream maintenance on Mall River. Cut and fill works for new culverts. New flood defence embankments. Equipment for channel works and wall pointing. Creation of new access tracks. Temporary traffic controls. Fencing for health and safety maintenance.

## 2.4 Health & Safety

OPW and any contractors engaged under this construction contract will comply with the appropriate health and safety regulations, including:

- Safety, Health and Welfare at Work Act, 2005;



- Safety, Health and Welfare at Work (General Application) Regulations 2007;
- Safety, Health and Welfare at Work (Construction) Regulations, 2006; and
- Safety, Health and Welfare at Work (Control of Noise at Work) Regulations, 2006.

A detailed Health and Safety Plan and Risk Assessment will be required for the development.

## 2.5 Site Security Arrangements and Public Health and Safety

### 2.5.1 Introduction

The following section details plans to ensure the general public is adequately protected from activities occurring within the site during construction. The OPW will implement documented strategies in compliance with Safety and Health Regulations to provide a safe and secure site. The works are will be maintained in such condition so as to ensure public safety and local amenity.

### 2.5.2 Permits / Approvals

Permits / approvals which may be applicable to the works include:

- Permits for openings to public roads, footpaths and grassed areas; and
- Permits for abnormal loads.

### 2.5.3 Fencing of Site

The site will be secured by a fence, hoarding or another suitable site barrier system, which will advise against unauthorised entry. Before and during construction work, all excavations will be fenced so they do not pose a danger to life or property.

### 2.5.4 Safety and Security

Adequate lighting, safety signage and traffic controls will be provided at all times. Traffic controls and the traffic management plan will comply with Chapter 8 of the “Traffic Signs Manual” published by the Department of the Environment, Heritage and Local Government (DoEHLG) and/or Council requirements.

During construction, open ends of the culverts will be fenced off.

Security measures will be in place at all times when the site is not in operation. Security measures will be provided to safeguard site materials and equipment.

All dangerous chemicals will be properly stored in secure areas. Required quantities of chemicals will be nominated and procedures will be put in place for the location of storage facilities, secure access and spillage procedures.

#### 2.5.5 Signage

Signage specifying security measures and key contact details will be erected on the perimeter of the construction site (i.e. attached to the site entrance gate, fence or hoarding).

Any sign, road markings, street furniture, etc. affected by the works will be relocated or protected and kept in good repair. When installing hoardings, attention will be paid to the effects that such items may have on pedestrian travel paths at intersections.

#### 2.5.6 Public Domain

The OPW will be responsible for any damage to the road, kerb, stormwater drains and street furniture that result from the construction work. Any impact, which may affect pedestrians, cyclists and motorists' safety, will be repaired as quickly as possible.

The general public will be protected from construction activities including vehicles accessing/egressing the site entry. Precautions will be fully specified and may include the following measures:

- The use of traffic controllers;
- Restriction on the hours of operation of these activities;
- Restriction on the type of machinery to be used; and
- Security mesh or barriers to separate the public from the work area.

All cranes or mobile lifting equipment operations shall be confined to within the limits of the works area. Unless otherwise permitted, an obstruction will not protrude from the site causing it to interfere with pedestrians or traffic using the road. Likewise, unless otherwise permitted, all construction materials will be stored onsite.

In the case of any damage to assets in the public domain, the OPW shall make safe the damage following consultation and agreement with Tipperary County Council as appropriate and reinstate damaged assets at the completion of the works.

#### 2.5.7 Excavation

The location and extent of excavations on the site will be specified and the means of containing sediment, especially in wet weather, will be detailed. The area of land to be cleared will also be minimised and stripping and excavating the site will be avoided until construction is about to start.

Excavations adjacent to or in close proximity to a road or pathway will be designed to support the road or pathway.

#### *2.5.8 General Site Management and Upkeep*

All works and potential impacts of construction will largely be contained within the confines of the works area. All precautions for public protection within the street/public domain will comply with the Building Regulations, local law and Safety, Health and Welfare requirements. Raw materials stored on the site will be adequately secured to prevent unnecessary and unsightly dispersal of the materials around the site and public areas. Trees will be protected where they are near the proposed demolition, excavation and construction works.

Trucks leaving the site will be adequately cleaned to ensure soil, mud and other site debris is prevented from spilling onto adjoining roads and footpaths. Roads and footpaths will be cleaned on a regular basis.

#### *2.5.9 Emergency Plan*

The OPW will be responsible for developing a detailed emergency plan. This Emergency Plan will be prepared in compliance with relevant Safety and Health in Construction Regulations. The Emergency Plan will be activated in the event of flood events, fire, chemical spillage, cement spillage, collapse of structures, failure of equipment etc. The Emergency Plan must include contact names and telephone numbers for Tipperary County Council (all sections/departments); Ambulance; Fire Brigade and the Garda Authorities.

### **2.6 Construction Facilities**

Prefabricated temporary buildings will be provided for on-site workers over the course of the construction programme. These facilities will be for sanitary and for canteen purposes. A site office and reception will also operate from such temporary buildings.

Any effluent or dirty water generated within the temporary buildings will be drained to an effluent holding tank. This tank will be emptied periodically and the effluent exported by a permitted haulier to an approved wastewater treatment plant.

### **2.7 Construction Programme**

It is anticipated that construction works will follow the following programme:

1. Consultation with relevant statutory authorities (including Inland Fisheries Ireland) to agree a works programme and detailed design which minimises impacts to aquatic ecology;
2. Secure site, establish construction reception, erect security fencing and notices;

3. Site clearance of vegetation. Clearance of woody vegetation will only extend to areas required within the site works area;
4. Construct new weir and culverts. Utilise excavated material for new embankments. Import material if required; and
5. Excavation of the Mall River and constructions here and in adjacent areas. This will aim to minimise impacts on aquatic ecology through appropriate mitigation (refer to Chapter 7).

The estimated construction period for the project is 12 months, as per indications provided by the OPW, however, it may be phase over a number of years; excluding planned stoppages and any periods lost due to bad weather. This allows for several elements of the work which are highly weather dependent and also allows for probable environmental time constraints.

### *2.7.1 Site Access and Egress*

The layout of temporary roadways required for construction will be shown within the Construction Management Plan. The various site road types will be constructed in accordance with the following specifications:

- Temporary access/haul roads will be designed and constructed to accommodate the existing ground conditions. This will reduce consolidation and avoid any permanent damage to the land;
- Haul roads which will be required in a number of areas will be designed and constructed using well-graded crushed rock, reinforced with geogrid layers. The roads will be up to 6m wide and approximately 300mm deep to accommodate the safe passage of all vehicles. These temporary roads will be subject to weekly inspection and maintenance works as required; and
- On completion of the excavation and construction activities, all temporary access roads will be removed and the land reinstated.

### *2.7.2 Construction Wheelwash*

A wheelwash will be provided at exit points during the construction phase. The wheelwash will be positioned to ensure that vehicles leaving the works area do not carry excess soil and material onto the adjoining public road infrastructure.

## **2.8 Construction Methods**

The construction of this scheme largely involves excavation and movement of material. For project planning purposes, it is intended to maximise dry excavation of materials during “dry” periods, to ensure minimum soil runoff to the Mall River. Material dug out for the proposed culverts will be used as far as possible for the embankment construction. Other proposed works include a road ramp, weir, fish pass, gravel trap, debris trap, culverts, channel constriction, possible bridge underpinning and reinforcement and works to the channel walls.

### **Culvert/ Embankments ‘Dry Dig’ Sections**

Material excavated will be worked into the new embankments where possible. Temporary storage of material may also be necessary though this will take place away from the river and follow requirements detailed in the method statements to minimise surface water runoff. A temporary access/haul road will be constructed, where required, to allow transfer of material to more distant embankments at the south of the works area. In addition a temporary bridge over the river south of the town will be required to access embankments on the left bank of the river.

Transport of excess materials will be undertaken using low ground pressure vehicles. Any excess excavated material will be deposited in a tip area, where it will be loaded into rigid bodied road trucks for disposal to permitted sites.

### **River Mall – ‘Wet Dig’ Section**

It is not anticipated that any material encountered during the construction works will be so wet that it would require mechanical dewatering.

#### *2.8.1 Excavation Quantities and Materials*

The excavation, transport and disposal of excavated material and import of concrete material, generated for the works will be the largest element of work.

The total excavation will be approximately 20,586m<sup>3</sup> for the length of the scheme (includes 60m of inlet). This represents an average 25.57m<sup>3</sup> per meter of the excavation.

#### *2.8.2 Material Disposal/ Re-use?*

##### **Option 1 – Removal from site - local disposal**

##### **Option 2 - Localised disposal on site**

Where possible excavated material will be incorporated into the embankments and final landscaping of the works area or spread locally. This will depend however on the suitability of the excavated material, and unsuitable material will be removed off site for disposal in permitted facilities.

Any material requiring disposal offsite will be disposed of at a permitted licensed facility based on its level of contamination.

Material will be reused as far as possible. For example material used in the temporary access roads can be utilised elsewhere. Existing walls will be retained and refurbished as part of the works where possible.

### **Disposal of the Material from River Bed**

Dredged material will be regraded as far as possible into one side only of the river bank. Excess material will be utilised in the embankments or removed from site. The length of the proposed scheme is illustrated in Figures 2-1 and 2-2. Within this area the length of channel and bank sides impacted will be kept to a minimum.

Material dredged from the river bed will be very wet. It is expected that stockpiling will reduce the water content to an acceptable limit for transport.

It is assumed that stockpiling on site will be employed as the first option. However, this is dependent on land availability and any discharge constraints on the latent liquid. A further consideration is timescale, for example, drying time of the material and how long it will have to remain stockpiled prior to removal off-site.

#### **2.8.3 Construction Restoration**

The commitments to restoration and aftercare are as follows:

- During all stages of construction within the site, all reasonable measures will be adopted to confine workings to within as defined a construction corridor as possible, so as to minimise impacts on the surrounding environment;
- The excavation programme will be designed to take cognisance of the soft ground conditions existing within parts of the site;
- The construction programme and measures will also take account of the environmental sensitivities existing within the site;
- On cessation of works, the lands within the works footprint will be landscaped to a pre-construction landform, sympathetic to the surrounding landscape character;
- All exposed soil surfaces will be seeded; and
- The OPW will work in association with the environmental consultants to ensure that all appropriate mitigation measures are carried out in accordance with this EIS.

The recommendations outlined in Chapter 6, Chapter 7 and Chapter 12, dealing with the ecology and landscaping of the site respectively will be put in place. These recommendations will be reviewed, if necessary, as the works progress.

## **2.9 Construction Environment Management Plan (CEMP)**

### **2.9.1 Introduction**

A Construction Environment Management Plan (CEMP) will be drawn up prior to the commencement of construction activities, in order to minimize the impacts to the environment during construction. The

Plan will detail the allowable working day, construction traffic, parking arrangements and will incorporate environmental protection measures and will be included as a part of the contract for any part of these works. Provisions to reduce the environmental impact of the construction activities will include the following:

- Implementation of recommendations from Inland Fisheries Ireland and mitigation measures detailed in Chapters 6 and 7 of this EIS in relation to ecology aimed at minimizing construction and operational impacts of the proposed works;
- Requiring contractors to ensure that no pollution or obstruction of watercourse is caused by their operations;
- Requiring contractors to comply at a minimum with the provisions of BS5228 *Code of Practice for Noise and Vibration Control on Construction and Open Sites* – Part 1 and 2 (2009);
- Requiring contractors to take reasonable precautions to ensure that all wastewater discharged shall not be harmful to or cause obstruction or deposit in drains and to prevent oil, grease or other objectionable matter being discharged into drains;
- Requiring contractors, during the execution of works, to keep all plant and materials and all equipment connected with the construction of the works in good order and clean and tidy;
- Requiring contractors to remove any waste materials from the site to a licensed waste facility;
- Requiring contractors to ensure that the public roads in the vicinity of the site are maintained free from all mud, dirt and rubbish, which may arise from or by reason of the execution of the works. To facilitate this, a wheelwash will be employed on site and road cleansing undertaken as required;
- Prohibiting the disposal of excess concrete on any part of the construction site;
- Requiring the contractor to provide a designated bin for washing down the chutes of concrete lorries on site;
- Requiring the contractors to keep the construction compounds free and clear of excess dirt, rubbish piles and scrap wood etc. at all times;
- Requiring the contractors to keep the designated parking area and other common areas clear and free of rubbish and debris;
- Requiring contractors to be responsible for the disposal of all wood, food, food packaging and paper generated during the construction phase and requiring them to furnish containers and vehicles to collect and haul these items and dispose of them to a licensed waste facility. Dumping of these items within the construction site will be prohibited;
- Requiring scrap materials, rubbish, etc. to be hauled out of the work areas (daily) and disposed of by the Contractor on a daily basis to a licensed waste disposal facility;
- Requiring the contractor to obtain any necessary permits from the Local Authority or Environmental Protection Agency for the disposal of waste;

- At the completion of the work, require contractors to leave the construction area in a neat, clean and orderly condition;
- Requiring that all temporary buildings associated with construction of the development comply with the Safety, Health and Welfare Regulations. On completion of the works, contractors will remove them entirely and restore the surface of the land to its original condition or other reasonable conditions; and
- Parking facilities for construction vehicles and private transportation will be located within the development site. Temporary site fencing will be erected and maintained to secure the site during the construction phase.

### 2.9.2 Noise

Nuisance associated with noise is more likely to arise at night time or during weekend periods. For this reason all earthmoving, construction and site development associated with this project will be restricted and will not be normally undertaken after 18.00 and before 08.00 daily. There will be no Sunday working.

All plant and machinery used on-site will comply with the EC (Construction Plant and Equipment) Permissible, Noise Levels Regulations 1988 (SI No. 320 of 1988). Periodic assessment will be undertaken to identify noisy plant and any necessary modifications or repairs will be made.

All site activities will be planned with a view to minimising the impact of noise. This can be achieved by practical means such as locating stockpiles of excess cover material in areas where they provide acoustical screening.

The Contractor responsible will be required to take all necessary precautions to ensure the enjoyment of privacy by third parties, and will at all times be required to comply with the recommendations of BS 5228, Noise Control on Construction and Open Sites, Part 1 1984, Code of Practice for Basic Information and Procedures for Noise Control.

### 2.9.3 Dust

Due to the nature of the development, i.e. predominantly associated with excavation, during prolonged dry periods windblown dust may impact on the surrounding environment; however the measures detailed will mitigate their impact. A full Dust Management Plan will be implemented into the Construction Environmental Management Plan.

All exposed soil surfaces will be vegetated as soon as possible following placement to anchor the soil and reduce the surface area open to the environment.



In periods of dry weather, spraying of the access routes and other exposed areas will be undertaken to help reduce dust emissions. The wheelwash proposed on site will ensure that the vehicles using the site do not cause dust emissions.

#### 2.9.4 *Climate*

Given the nature of the activities, potential impacts are not expected on the local climate of the area.

#### 2.9.5 *Groundwater*

The construction methodology does not entail any dewatering; therefore the water levels will not be artificially lowered. The groundwater levels in the environs of the river are controlled by the surface water level.

#### 2.9.6 *Surface Water*

All dry digging works including construction of the culverts, weir and embankments will avoid impacts to the Mall River excluding the final connection with the Mall River at two points (north and south of the town). Given that the culvert levels will be above Mall River flow levels (except during significant flood levels) no significant run-off should occur beyond slight negative impacts expected following implementation of mitigation measures. Other in-stream proposed works will follow mitigation as detailed in Chapter 7 *Aquatic Ecology*.

### 3 EXAMINATION OF ALTERNATIVE OPTIONS

#### 3.1 Project History

A Flood Relief Feasibility Study was undertaken by the OPW for the town of Templemore, County Tipperary. The purpose of this engineering study was to identify, if possible, a preferred flood relief scheme to reduce the frequency or impact of flooding in the town, and to develop the scheme to outline design. The process of identifying the preferred scheme included an assessment of the range of measures and scheme options available to determine their technical, economic and environmental viability.

TOBIN Consulting Engineers was appointed by the OPW as a specialist environmental consultant to assist the OPW with the environmental aspects of the engineering study. The environmental aspects of the study included identification of any environmental constraints and assessment of the environmental impacts of the possible flood relief options. TOBIN Consulting Engineers prepared a Constraints Study to identify any key environmental issues that exist within the study area and that may be impacted upon by possible flood relief measures. The results and constraints determined in the Constraints Report informed the final flood relief scheme design by the OPW.

This EIS examines the impacts of the preferred flood relief scheme option (Viable Option 4- Long Diversion). To adequately consider the potential environmental impacts of the Long Diversion scheme each section of the EIS considers using the new channel for two scenarios:

- A. The Mall River will be left in its current channel route, with the new channel taking only flood flows;  
and
- B. The Mall River is diverted in full to the new channel.

#### 3.2 Alternative Options

##### 3.2.1 *Choice of Inlet Option*

The inlet configuration sets important rules on how a flow diversion will operate, such as the amount of water that will need to run down the river before the need to bring the diversion into use. As part of this project design, six different options were considered. The final option though, minimises land-take and has other features which make it the preferred choice.

### 3.2.2 Viable Drainage Scheme Options

The flood situation in Templemore has been subjected to detailed analysis. Engineering and environmental studies have concluded that viable flood relief scheme options do exist and that these require a diversion of flows through the town.

Sufficient space is available for two possible diversion routes, these are:

- A 805m Long Diversion, discharging approximately 230m downstream of Small's Bridge; and
- A 380m Short Diversion, discharging just upstream of the Mall Road private bridges.

The upstream stretch of both flood-diversion routes are the same with different works required in each down-stream.

The two diversion route options were subsequently divided into four potentially viable options for consideration. Viable Option 1 transports peak flows down a 6.5m-base-width Long Diversion whereas Viable Option 4, has a 7.5m-base-width and transports the entire river's flow down the Long Diversion; possibly reduced by a Sweetening Flow. Viable Option 2 transports peak flows down a 6.5m-base-width Short Diversion whereas Viable Option 3, has a 7.5m-base-width and transports the entire river's flow down the Short Diversion; possibly reduced by a Sweetening Flow.

The four viable options can be summarised in terms of their combination of works within the town, namely, diversion, excavation and works at private access bridges as follows:

1. Viable Option 1: A flood-defence line upstream of the town, the Long Diversion, excavate the river to just upstream of Shortt's Bridges and raise the decks of the three private access bridges.
2. Viable Option 2: A flood-defence line upstream of the town, the Short Diversion, excavates the river to above the three bridges and replaces them with one bridge.
3. Viable Option 3: Same as option 2, only the entire river is diverted. This avoids the risk of riverside walls along the by-passed stretch collapsing and causing flooding.
4. Viable Option 4: Same as Option 1, only the entire river is diverted. This avoids the risk of riverside walls along the by-passed stretch collapsing and causing flooding.

Options 2 and 3 employ a Short Diversion that rejoins the river approximately 110m upstream of Small's Bridge. These have however, significant channel works in that area, a total river length of one third of a kilometre. They also both require two private access bridges to be removed and for Small's Bridge to be converted into a 4m-wide flume. This has unfortunate consequences of inducing Critical Flow conditions through the bridge and the need to dissipate the resulting extra flow energy

immediately downstream, within the river. This gives rise to Health and Safety concerns if someone was unfortunate to fall in, therefore long stretches of high walls or railings along both banks of the river and the provision of lifebuoys would be necessary.

Options 1 and 4 employ a Long Diversion. Option 1 sends flood flows down a 6.5m-base-width and requires the extension of the Richmond Road culvert downstream by approximately 60m and at Church Avenue, culverts under the small access road, the avenue and a private garden to its south. Option 4 uses the same diversion (with a 7.5m-base width) for full river flows, possibly reduced by a Sweetening Flow in the existing river channel. Option 4 requires culverts at Richmond Road and Church Avenue, two 4m field access bridges, one in each area of open land below the new bridges. Because the bypassed stretch of the Mall River is no longer required with Option 4, there is no need to sluice its drainage outlets. In addition, Option 4 has no residual risks in that area relating to the collapse of riverside walls. Another advantage to Option 4 is that it does not need river works or defensive walls in the area around Small's Bridge and adjacent properties. In terms of 'all in cost' Option 4 is the Preferred Viable Option for dealing with flooding in Templemore.

The preferred flood relief scheme option is Viable Option 4: Long Diversion.

### *3.2.3 Disadvantages of Sweetening Flow in old channel*

Viable Options 3 and 4 described above, both consider diverting the entire river down the new channel while potentially leaving a Sweetening Flow of  $0.5 \text{ m}^3/\text{s}$  within the old river channel. This EIS considers the Sweetening Flow as part of the preferred flood relief scheme option, Viable Option 4. It is however considered that the diversion of a Sweetening Flow will act essentially as an abstraction to flows within the new channel. If the Mall River continues to receive discharges from storm runoff and other sources, by reducing its waste assimilation capacity, this abstraction could potentially impact the Mall River's ecological status; it could become more polluted. In addition, as this level of abstraction is significant in terms of low summer flows, the hydro-ecological impacts on the diversion channel could be severe, as it would dry-out each year.

If a Sweetening Flow remains within the flood relief scheme, there would only be river flow in the diversion channel for approximately 100 days a year, and clearly for a greater overall total in a wet year. As these days will not be successive, it is likely to lead to environmental issues, where, each year, aquatic vegetation and invertebrates, etc. get to colonise the diversion only to die out during fine weather; when flow from the catchment drops below  $0.5 \text{ m}^3/\text{s}$  on a sustained basis, and only the existing river channel would remain wet.

Also Viable Option 4 involves a Long Diversion. The Long Diversion needs to trench across Church Avenue. Here, a Combined Sewer is the overflow from a chamber just to the west. This Combined

Sewer cannot be re-laid along the western side of Church Avenue to gain elevation, nor can it be strapped to the side of the bridge as it is approximately 1.5m below the road. The option being considered allows this overflow discharge directly to the new channel. To ensure appropriate flow levels are in place in order to enable the diversion channel to 'clean itself', keeping a Sweetening Flow, which would act as an abstraction to the new channel flow, is not suitable.

Given that the flow exceeded 95% of the time is only  $0.004 \text{ m}^3/\text{s}$  (about 18 days a year has less flow), it is not possible to divide the low flows between two channels and keep them both environmentally healthy.

Fundamentally, a Sweetening Flow is not sustainable and following consideration it will not be included within the preferred scheme; Viable Option 4.

## 4 PLANNING AND DEVELOPMENT CONTEXT

### 4.1 Introduction

This section will examine the planning and development context in relation to the proposed works.

### 4.2 Planning and Development Context of Development

#### 4.2.1 National Level

The Office of Public Works (OPW) is the body through which Central Irish Government exercises its statutory responsibilities under the Arterial Drainage Act 1945, and the Amendment to the Arterial Drainage Act 1995, in respect of river drainage and flood relief.

Templemore Town has been subject to significant flood events (detailed previously) which have caused significant economic impacts. The proposed scheme is a response to these risks, to provide flood protection up to the 1:100 year event.

In September 2004 the Government confirmed the OPW as the State's lead agency on flooding, to be tasked with delivering an integrated multi-faceted programme aimed at mitigating flood risk and impacts. The selected flood relief scheme for Templemore Town follows investigations detailed in the constraints reports over the last number of years to determine the best flood relief option which balances economic, environmental and technical issues; and consultation with Tipperary County Council (including previous liaison with North Tipperary County Council and Templemore Town Council), the Department of Environment, Community and Local Government (DoECLG) and Inland Fisheries Ireland (IFI).

National guidelines (2009)<sup>1</sup> entitled *The Planning System and Flood Risk Assessment – Guideline for Planning Authorities*, have been published by the OPW and Department of Environment, Heritage and Local Government (DoEHLG), for building on river floodplains.

These guidelines require the planning system at national, regional and local levels to:

(1) Avoid development in areas at risk of flooding by not permitting development in flood risk areas, particularly floodplains, unless where it is fully justified that there are wider sustainability grounds for

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<sup>1</sup> <http://www.flooding.ie/media/The%20Planning%20System%20and%20Flood%20Risk%20Management.PDF>

appropriate development and unless the flood risk can be managed to an acceptable level without increasing flood risk elsewhere and where possible, reducing flood risk overall;

(2) Adopt a sequential approach to flood risk management based on avoidance, reduction and then mitigation of flood risk as the overall framework for assessing the location of new development in the development planning processes; and

(3) Incorporate flood risk assessment into the process of making decisions on planning applications and planning appeals.

#### 4.2.2 Regional Level

Tipperary County Council does not have any specific plans relating to existing flood risks. General policies detailed are aimed at minimising risks of flooding and are detailed below.

Policies detailed below are taken from the North Tipperary County Development Plan (2010-2016).

##### ***Policy ENV 18: Flooding***

It is the policy of the Council to implement the recommendations of the DoEHLG Guidelines entitled *The Planning System and Flood Risk Management* in the management of development within the County.

##### **Policy ENV 19: Protection of the Flood Plain**

It is the policy of the Council to operate a sequential approach to the assessment of proposed developments on established flood plains. No development shall be permitted on such lands, in the absence of a justification test which demonstrates that the proposals comply with the DoEHLG guidelines on Flooding entitled *The Planning System and Flood Risk Management*. Where development is considered appropriate adjacent to the existing flood plain and would result in the alteration of natural drainage systems, the Council will require mitigation measures to minimise the risk of flooding.

##### **Policy ENV 19a: Flood Alleviation and Mitigation Measures**

It is the policy of the County Council to ensure that development does not increase the risk of flooding, and development in low-lying areas or known flood plains will be required to produce a site specific Flood Risk Assessment and a Justification Test to demonstrate that the development will not contribute to flooding within the immediate or wider catchment area. Regard will also be had to Policies ENV 18 and ENV 19 and to the *Planning System and Flood Risk Management Guidelines*.

##### **Policy SERV 9: Flood Risk Assessment**

The Council will require a comprehensive Flood Risk Assessment for proposals in an area at risk of flooding, adjoining same or where cumulative impacts may result in a flood risk elsewhere. Regard will

also be had to Policies ENV18 and ENV19 and to the *Planning System and Flood Risk Management Guidelines*.

#### 4.2.3 Local Level

The Templemore and Environs Development Plan 2012–2018 sets out the framework for proper planning and sustainable development and use of land within Templemore Town and Environs up to 2018 and beyond.

##### Objective WS9: Floods Directive

It is an objective of the Council to implement the Floods Directive at a local level, and to have regard to the *Preliminary Flood Risk Assessment* (PRFA) and the *Catchment-based Flood Risk Assessment and Management* (CFRAM) when these documents are finalised.

##### Objective WS10: Flood Relief Measures

It is an objective of the Council to co-operate with the OPW and seek the implementation of the flood relief measures which will serve to protect the town for potential flood events. On implementation of the scheme, it is the Council's intention to re-examine the zoning objectives of the plan and in particular lands, which will be afforded flood protection close to the town centre.

##### Objective WS10a: Flood Risk Management

It is the policy of the Council to implement a sequential approach to the assessment of development in area of Flood Risk. Development shall not be permitted, unless it is demonstrated that the development satisfies the justification test as outlined in *Planning System and Flood Risk Management Guidelines – Guidelines for Planning Authorities, 2009*. The Council will require proposals, on a site specific basis and where deemed necessary, to be accompanied by a Flood Impact Assessment to enable the Council make a full determination of the risk of development proposals.



## 5 HUMAN BEINGS / SOCIO ECONOMIC

Human Beings are a vital element to be considered as part of the Environmental Impact Assessment (EIA) process. The purpose of this assessment is to examine the existing environment, the current and the potential impacts of the proposed flood relief scheme on human beings. This section will focus on population, employment, tourism and amenities during the construction and operational phases of the proposed works.

### 5.1 Study Methodology

A desk study was carried out in order to examine all relevant information pertaining to planning and socio economic activity in the study area. The following information sources and references were used to compile this chapter:

- EPA Guidelines - Information to be contained in Environmental Impact Statements 2002;
- OSI mapping and Aerial Photography to identify land use and possible amenity sites;
- North Tipperary County Development Plan 2010-2016 and the Templemore and Environs Development Plan 2012-2018;
- Central Statistics Office (CSO) information; and
- Fáilte Ireland Information in relation to tourism amenity in conjunction with websites of relevant tourism sites and amenities for the area.

Data collated during the early stages of the project (i.e. the constraints study, the Environmental Assessment of Viable Options and the Engineering Report) was utilised in the preparation of this report. Consultation letters have been sent to Fáilte Ireland, Department of Transport Tourism and Sport, Community Enterprise Department (Tipperary County Council), Local Enterprise Office Tipperary and Shannon Development but to date no response has been received.

### 5.2 Existing Environment

Under the Local Government Act, 2014, North Tipperary County Council and Templemore Town Council were disbanded and all assets and functions were transferred to Tipperary County Council in June 2014. Therefore the proposed works area is located within the administrative area of Tipperary County Council. The town of Templemore is situated 12km north of Thurles and 18km southwest of Roscrea. As stated in the North Tipperary County Development Plan 2010-2016, North Tipperary is composed of a hierarchy of urban and rural settlements and Templemore is considered to be a primary service centre and one of the four main urban centres in North Tipperary.

### 5.2.1 Population

To understand an area, its population must be examined. This section will look at the population change over the period 2002-2011. The proposed flood relief scheme is located within Templemore Urban District and the Environs of Templemore. Table 5-1 below illustrates the population change between 2002-2011 in the State, Munster, Tipperary (North), Templemore Urban District and the Environs of Templemore.

**Table 5-1 Population Change 2002-2011**

Population Change 2002-2011				
	2002	2006	2011	% Change
State	3,917,203	4,239,848	4,588,252	17%
Munster	1,100,614	1,173,340	1,246,088	13%
Tipperary (North)	61,010	66,023	70,322	15%
Templemore Urban District	2,159	2,255	1,941	-10%
Environs of Templemore	111	129	130	17%

Source: CSO 2011

Table 5-1 shows that the population of Templemore Urban District increased in 2006 but then decreased in 2011 with an overall population decrease of 10%. The State as a whole experienced a population increase (17%), as did Munster (13%), Tipperary (North) (15%) and in the Environs of Templemore (17%).

The preferred settlement strategy for Templemore as outlined in the North Tipperary County Development Plan 2010-2016 is as follows; *‘Templemore with its location on the Dublin/Cork rail route will be promoted as an attractive place to live and to do business. The town offers unique opportunities as a centre for employment and entrepreneurship. The town’s residential function will be strengthened, its retail function enhanced as the population grows, and its strong leisure resources, including its 70 acre parkland and lake, protected and enhanced’* (Ref Section 3.6.2).

A public information day and consultation event was held in the Templemore Town Council office on the 28<sup>th</sup> March 2014 to inform the local population and general public about the project.

### 5.2.2 Employment

Employment is an important indicator of the economic standing of an area. This section examines unemployment levels, employment status and industrial groups in Templemore. The Quarterly National Household Survey (QNHS) provides details of unemployment on a regional level. Templemore is located in the Mid-West Region therefore this Region will be used to illustrate unemployment in the area. The Mid-West Region consists of Clare, Limerick City, Limerick County and Tipperary (North).

**Table 5-2 Quarterly National Household Survey (Q3 2014)**

Quarterly National Household Survey (Q3 2014)		
	Unemployment Rate	Participation Rate
State	11.3%	60.4%
Mid-West Region	11.4%	59.6%

Source: CSO 2015

Table 5-2 above illustrates the findings from the most recent QNHS quarter three (July-September 2014). The unemployment rate is the number of unemployed persons expressed as a percentage of the total labour force. The unemployment rate for the State was 11.3% while the unemployment rate for the Mid-West Region, which contains the town of Templemore, was 11.4%. The Mid-West Region has a slightly higher unemployment rate than the State.

The participation rate is the number of persons in the labour force expressed as a percentage of the total population (over the age of 15 years). Currently the participation rate in the State is 60.4%. The Mid-West Region's participation rate is 59.6%, which is lower than that of the State.

The Central Statistics Office (CSO) publishes figures relating to the live register. These figures are not strictly a measure of unemployment as they include persons who are legitimately working part time and signing on part time. However they can be used to provide an overall trend within an area.

**Table 5-3 Live Register**

Live Register				
	Dec 2012	Dec 2013	Dec 2014	% Change
State	423,733	395,411	356,112	-15.9%
Mid-West Region	36,528	33,800	30,056	-17.7%
Tipperary (North)	7,335	6,976	6,271	-14.5%
Thurles	3,026	2,833	2,536	-16.2%

Source: CSO 2015

The figures in Table 5-3 above show that over the period December 2012–December 2014 the number of persons on the live register decreased in all regions. This trend indicates that they were more persons unemployed in Tipperary (North) in December 2012 than in December 2014. Templemore has no local unemployment office. The figures above are for the Thurles office which includes the Templemore area. Despite a decrease in live register figures, the overall trend since 2008 indicates a need for further employment.

### 5.2.3 Socio-Economic Profile of the Locality

Statistics detailing occupational group are provided in the 2011 Census for Templemore. Table 5-4 below illustrates that skilled trade occupations represent the highest number of workers (155), while sales and customer service occupations represent the lowest number of workers (58).

**Table 5-4 Occupational Group, Templemore**

Occupational Group, Templemore			
	No. Males	No. Females	Total
Managers, Directors and Senior Officials	43	18	61
Professional Occupations	46	64	110
Associate Professional and Technical Occupations	54	21	75
Administrative and Secretarial Occupations	19	77	96
Skilled Trades Occupations	136	19	155
Caring, Leisure and Other Service Occupations	12	47	59
Sales and Customer Service Occupations	17	41	58
Process, Plant and Machine Operatives	45	15	60
Elementary Occupations	58	48	106
Not stated	58	31	89
Total	488	381	869

Source: CSO, 2011

The Templemore and Environs Development Plan 2012-2018 states that; *'the town has significant economic advantages, in terms of its recently up-graded waste water infrastructure, its public and private transport infrastructure, its indigenous industries and the presence of third level institutions, including the Garda College'* (Ref Section 2.5). There are three primary and two secondary schools in Templemore. The Mall River does not currently provide any known employment in the town.

### 5.2.4 Land Use

The proposed flood relief scheme is located within the town of Templemore and its environs. The site location from north to south of Templemore Town includes poorly drained agricultural farmland (which is part of the River Mall floodplain), the town of Templemore including roads and paved areas beside buildings, passing through into more improved farmland south of Templemore Town.

### 5.2.5 Tourism and Amenities

North Tipperary, according to Fáilte Ireland, is located in the Shannon Tourist Region. The Shannon Region consists of Counties Clare, Limerick, Tipperary (North) and Offaly West. The most recent set of

annual statistics for the study area are for the year 2013. Table 5-5 below illustrates that the number of overseas visitors in 2013 to the Shannon Region was 931,000 and to North Tipperary 51,000. The total tourism revenue generated from these visits was 250.7 million from the Shannon Region and 19 million from North Tipperary.

**Table 5-5 Overseas Tourism 2013**

	Britain (000s)	Europe (000s)	N. America (000s)	Other (000s)	Total (000s)	Revenue (€million)
No. of Visitors-Ireland *	2,870	2,346	1,041	432	6,689	3,316
Shannon Region	332	247	280	72	931	250.7
N. Tipperary	28	9	6	7	51	19

Source: Fáilte Ireland, 2014

It states in the Templemore and Environs Development Plan 2012-2018 *'that Tourism in North Tipperary has not seen the growth experienced in other areas of the Mid-West Region'*. It also states that the *'Council considers that this is an area which requires a new focus, and while Templemore is not on an established tourism trail, it is considered that its proximity to the Rock of Cashel and the ease of accessibility by rail and by roads presents opportunities for new tourism linkages'* (Ref Section 5.7.1).

### **Designated Areas**

The nearest site designated for nature conservation is Templemore Wood proposed Natural Heritage Area (pNHA). This pNHA is adjacent to the proposed flood relief works.

### **Recreational Uses**

The pNHA of Templemore Wood is located within Templemore Park, which is located just northwest of the Templemore Town centre. The town park comprises a disused swimming pool, athletic track, playing fields and a pitch and putt course. Also located within this park are the ruins of a church and graveyard and a 13th century castle. The lake is utilised by anglers (detailed below) and is host to various bird wildlife.

A Slí na Sláinte route was launched in Templemore in 2008. This route is located within the town centre and is 2.8km in length. This circular route includes Patrick Street, Main Street, Mary Street, Church Avenue and Barrack Street. Templemore Wood and Town Park contains walking paths which traverse the wood and circle around the lake and contains an unmarked Slí na Sláinte route of 1.3km which follows the path along the lakeshore.

**Angling**

The Mall River, which is a vital tributary to the River Suir, contains spawning Salmon and Trout and other species of fish. The river rises in the Devil's Bit Mountain and joins the River Suir southeast of the town of Templemore. There are no visible stretches of river dedicated to angling. Local residents state however that fishing takes place intermittently in the Mall River between 17<sup>th</sup> March and the end of September each year. They state that fishing takes place in the area parallel to the Mall Road between O'Dwyer's Bridge and the Small's Bridge. Fishing of the river is also likely upstream and downstream of the town. There is no visual evidence of frequently used access points to the river for fishing activity; however, local residents state that access is gained from adjoining fields or from any easy access point.

**Coarse Fishing**

Templemore Lake is located in the Town Park and is only connected to the Mall River by an overflow pipe and may overflow into river at times of heavy rain. Fishing in this lake is coarse fishing and the lake contains stocks of Pike, Perch, Trench and Roach.

**Views and Prospects**

There are no designated protected views and prospects or scenic routes listed within the study area.

## 5.3 Potential Impacts

### 5.3.1 Construction Impacts

**Effects on Population**

The site of the proposed flood relief scheme is located upstream, downstream, and within the town of Templemore. The construction of this scheme will therefore have impacts on residents and businesses within the town and on the properties and lands affected by the construction of the proposed scheme.

The impacts on local populations in terms of traffic, access to properties, air emission, visual impact and noise are dealt with in other relevant sections of this EIS.

Construction activities will occur above Shortt's Bridge where the inlet channel will be constructed to Shortt's Field where the debris and gravel traps and drop weir are to be constructed. A new channel route is proposed which is to begin in Shortt's Field and finishes approximately 230m downstream of Small's Bridge. In the north area of the town, the proposed channel route will be adjacent to an existing property located off Richmond Road and through a number of garage properties. It is proposed that Hassett's garage will be removed. The route outlined for the south area of the town (refer to Figure 2-1 and Figure 2-2) will replace an access lane and adjacent strips of gardens on the northern side of Church Avenue and will run through the garden of an existing property on the south side of the road.

In addition, the width of excavation will be greater than the eventual land-take for the channel and its culverts. As a result, properties will suffer a temporary loss of land that will be made-good by backfilling at the end of the construction. For example, it is possible that the garden shed on the southern side of Church Avenue will have to be removed and subsequently replaced.

Other proposed construction works include the development of flood defence embankments, defence walls and regrading portions of the existing river. Temporary access will be provided to properties, which will be impacted upon by the proposed construction works.

Potential impacts regarding the public health and safety during the construction phase, relate primarily to concerns about those either straying or trespassing into the construction site, as well as the health and safety of workers and visitors to the site. The day-to-day operation of the construction activities, including the workings associated with all machinery and on-site vehicles, and how visitors are to present and conduct themselves when undertaking visits to the site, will be in compliance with all health and safety laws and regulations pertaining to the OPW's Health and Safety Statement.

### **Effects on Employment**

The construction activities will generate and retain employment either directly in the construction of the flood relief scheme or in the supply of services, machinery and construction materials.

### **Effects on Landuse**

During the construction phase there will be a temporary change of landuse in the areas surrounding the proposed flood relief scheme. This will be required in order to construct the proposed new channel, embankments and to carry out other necessary works.

### **Effects on Tourism and Amenities**

The proposed flood relief scheme will have minimal impacts on tourism and amenities in the area surrounding the scheme. The proposed works will not have any impact on the Templemore Wood pNHA. The potential impact of construction activities on the Mall River and Templemore Lake are discussed in Chapter 7 *Aquatic Ecology* and Chapter 9 *Water* of this EIS.

It is proposed to carry out works adjacent to the disused swimming pool which is located within Templemore Town Park. These works include the construction of an embankment and access ramps are to be provided over the embankment along the existing footpaths. The impact on views will be experienced by road users however this impact will generally be of a temporary nature during the construction phase.

### 5.3.2 Operational Impacts

#### **Effects on Population**

Templemore has a long history of flooding, with a number of flood events having been reported over the last 150 years. The proposed flood relief scheme will have an overall positive impact on the population of Templemore and its environment as it will be designed to deal with the full 100-year peak flow.

#### **Effects on Employment**

The proposed flood relief scheme will not generate any significant employment activities during its operation.

#### **Effects on Landuse**

The proposed flood relief scheme will have a positive impact on landuse in the area. This is in terms of flood relief. Minor changes to the current landuse will occur from above Shortt's Bridge where the inlet channel will be constructed to Shortt's Field where the debris, gravel trap and drop weir are to be constructed. In Templemore Town, embankments and flood defence walls are also proposed. It is also proposed to infill sections of the existing river channel. This will change the current landuse at these points.

These proposals are required in order to protect properties and in the long-term will have a positive effect on the existing dwellings.

#### **Effects on Tourism and Amenities**

The proposed flood relief scheme will have negligible impact on tourism and amenities in the area surrounding the scheme. The effects on the Mall River and Templemore Lake fisheries are provided in Chapter 7 *Aquatic Ecology* of this EIS. There will be permanent visual impacts around Templemore associated with the addition of embankments, culverts and walls. This is discussed in more detail in Chapter 12 *Landscape and Visual Impact Assessment* of this EIS. The flood relief scheme when operational will not have any impact on any designated walking routes.

## 5.4 Mitigation Measures

The proposed works will be developed in a manner such that the impact on human beings is minimised. The following measures will ensure that the proposed flood relief scheme will have a minimum effect on the receiving environment.

### 5.4.1 Population and Landuse

Activities have the potential to impact on the local population in terms of increased construction noise, visual impact, traffic and dust. These have been addressed in other relevant chapters of this EIS



(Chapter 10 *Noise and Vibration*, Chapter 11 *Air Quality and Climate Change*, Chapter 12 *Landscape and Visual Impact Assessment* and Chapter 13 *Material Assets/ Traffic*).

Access ramps will be constructed on some of the proposed embankments to maintain access to properties and land. Access to existing properties will be maintained during the construction and operational phases of the project.

#### 5.4.2 *Employment*

The proposed flood relief scheme will generate employment during the construction phase. This impact is positive, therefore, no mitigation measures are proposed.

#### 5.4.3 *Tourism and Amenities*

The proposed flood relief scheme will not have a negative impact on tourism and amenities in the area.

## 6 TERRESTRIAL ECOLOGY

### 6.1 Introduction

This chapter of the EIS was prepared by TOBIN Consulting Engineers and considers terrestrial ecology. The assessment of aquatic ecology is addressed separately in Chapter 7 of the EIS and was conducted by ECOFACT Consultants. Terrestrial ecology references used in this assessment are presented in Volume 3, Appendix 6-1.

Key work elements in the proposed flood relief scheme considered are detailed below.

- A 60m-long inlet channel with Debris and Gravel Traps and a small Drop Weir.
- A new outflow from the lake to run under Blackcastle Road to the inlet channel.
- A flood-defence line north of the town, in line with a culvert over the new diversion.
- Relocating the river by constructing a new 805m long channel (with a 7.5m base-width) that begins in Shortt's Field and finishes approximately 230m downstream of Small's Bridge.
- As the bypassed stretch of river is no longer required, there are no residual flood risks from wall failure, etc and no need to sluice its drainage outlets.
- The road and access bridges will need to pass the full Climate Change flow of 21.63 m<sup>3</sup>/s.
- At Richmond Road and Church Avenue, separated by 8.4m, walls along both banks of the diversion both up- and downstream.
- Starting at the confluence (approximately 230m downstream of Small's Bridge) with a bed level of 107.3m OD, the riverbed will be re-profiled to finish at 106.1m OD 480m further downstream. The riverbed will be widened to 7.5m base-width from the diversion for approximately 450m and from there a transition returns to the existing 4.5m base wide over a further 250m (or so).
- A 90m-long embankment on the left bank (east side) below properties at Small's Bridge.
- A 320m-long embankment to defend the Railway View Estate area.
- To improve aeration and fish movement along the excavated river and diversion, a fish channel (Thalweg) will be dug and partially backfilled with gravels. While this will likely be about 0.3m deep with a 2m wide bed and up to 5 to 1 side slopes, it will be designed and constructed in consultation with the Inland Fisheries Ireland (IFI) and along the channel may be higher or lower and its width may vary.
- The channel from the upstream works to where the Mall discharges to the Suir is being designated for maintenance to prevent further growth of woody vegetation encroaching into the river or crowding-out the flowing floodplain.

- Impacts to the landscape will be reduced by using high quality finishes to works, grassed finishes to embankments and open channel sections, and by planting replacement and new vegetation; including in-channel, where possible.

### 6.1.1 Legislation

This ecological assessment has been prepared in accordance with the following legislation:

- Consolidated EIA Directive 2011/92/EU;
- Wildlife Acts 1976-2012;
- The Habitats Directive 92/43/EEC;
- The Birds Directive 2009/147/EC;
- The European Communities (Birds and Natural Habitats) Regulations 2011 [S.I. No. 411/2011];
- European Communities (Environmental Impact Assessment) (Agriculture) Regulations 2011 [S.I. No. 456/2011];
- European Union (Environmental Impact Assessment and Habitats) Regulations 2011 [S.I. No. 473/2011];
- European Union (Environmental Impact Assessment and Habitats) Regulations 2012 [S.I. No. 246/2012]; and
- Flora (Protection) Order, 1999.

In addition, in considering the ecological impacts of the proposed scheme, regard was made to the following guidance and information documents:

- CIEEM (2006). *Guidelines for Ecological Impact Assessment (Chartered Institute of Ecology and Environmental Management)*;
- DAHG (2011). *Ireland's National Biodiversity Plan: Actions for Biodiversity 2011 – 2016*;
- DoECLG (March 2013), *Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment*;
- DoEHLG (2009). *Appropriate Assessment of Plans and Projects in Ireland*;
- EPA (2003). *Advice notes on current practice (in the preparation of Environmental Impact Statements)*;
- EPA (2002). *Guidelines on the information to be contained in Environmental Impact Statements*;
- European Commission (2002). *Assessment of plans and projects significantly affecting Natura 2000 sites*;
- European Commission (2013). *Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment*;
- Fossitt (2000). *A Guide to Habitats in Ireland*;

- NRA (2005). *Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes*;
- NRA (2006). *Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes*;
- NRA (2006). *Guidelines for the Treatment of Otters prior to the Construction of National Roads Schemes*;
- NRA (2006). *Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes*;
- NRA (2006). *Guidelines for the Treatment of Bats during the Construction of National Roads Schemes*;
- NRA (2009). *Guidelines for Assessment of Ecological Impacts of National Road Schemes*; and
- Smith *et al.* (2011). *Best practice guidance for habitat survey and mapping in Ireland*.

## 6.2 Study Methodology

This ecological assessment comprised a desktop study, consultation and field surveys.

### 6.2.1 Desktop Study

The desk study comprised the following elements:

- Identification of all sites designated for nature conservation within 15km of the site and sites located further away that are potentially linked to effects of the development;
- Consultation with the Development Applications Unit, Department of Arts, Heritage and the Gaeltacht (DAHG);
- Review of National Parks and Wildlife Service (NPWS) and National Biodiversity Data Centre (NBDC) website and mapping;
- Review of Environment Protection Agency data;
- Review of Templemore Town and Environs Development Plan 2012-2018;
- Consultation with Inland Fisheries Ireland; and
- Review of Ordnance Survey maps in order to determine broad habitats that occur within the existing site and to aid with mapping habitats.

### 6.2.2 Field Survey

Field surveys were undertaken to assess various components of the ecology of the area. Surveys were initially carried out in 2008 and updated in 2014. Surveys included:

- Habitat assessment to include rare and protected species of flora;
- Faunal assessment to include birds, mammals (including otter and bats), amphibians, reptiles and invertebrates; and

- A separate aquatic ecology assessment was conducted by ECOFACT for the Mall River habitat corridor (refer to Chapter 7). Chapter 7 deals with aquatic flora and fauna e.g. fish species,

TOBIN Consulting Engineers undertook site visits to carry out habitat, bird and general mammal assessments on the 9<sup>th</sup> May 2014 and the 10<sup>th</sup> June 2014. A bat survey was carried out on the 2<sup>nd</sup> July 2014. The 2014 surveys updated and identified any change to previous survey findings (2008).

### **Habitat Assessment**

The habitat assessment was conducted within the scheme boundary and took in adjacent land in accordance with The Heritage Council's methodology, Best Practice Guidance for Habitat Survey and Mapping (Smith *et. al*, 2011) and habitats were classified according to The Heritage Council's *A Guide to Habitats in Ireland* (Fossitt, 2000). Plant identification and nomenclature principally follows Webb *et al.* (1996)<sup>2</sup>. Grass and fern identification and nomenclature was further assisted by Rose (1989)<sup>3</sup>. The predominant plant species for each habitat type were recorded in order to accurately determine habitats present on the site. Habitats were rated according to the Site Evaluation Scheme contained in the National Roads Authority's *Guidelines for Assessment of Ecological Impacts of National Road Schemes* (National Roads Authority, 2009). Refer to Volume 3, Appendix 6-2 for qualifying criteria.

### **Faunal Assessment**

Protected and common mammal surveys were conducted on the site and adjacent areas, including Templemore Lake and woodlands, given its proximity to the scheme and likely inclusion within protected mammal territories.

Signs of other fauna, (amphibians, invertebrates) found on the site were also recorded.

### **Otter**

Surveys were conducted for otter which primarily involved searching the Mall River corridor and adjacent Templemore Lake, for evidence/signs of otter (e.g. tracks, scats, holts and occasionally direct sightings).

An assessment of habitat suitability for otter was conducted within the works area (Mall River and adjacent Templemore Lake).

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<sup>2</sup> Webb, D.A., Parnell, J., & Doogue, D. 1996. *An Irish Flora*. Dundalgan Press (W. Tempest) Ltd., Dundalk.

<sup>3</sup> Rose, F. 1989. *Colour Identification Guide to the Grasses, Sedges, Rushes and Ferns of the British Isles and north-western Europe*. Viking

### Bats

Guidelines including NRA (2005)<sup>4</sup> and Kelleher *et al.*, (2006)<sup>5</sup> informed the survey methodology and mitigation proposed. An initial assessment of the suitability of existing buildings and trees was conducted during daylight hours. Structures including bridges and old culverts (riverside) were carefully inspected for bat signs such as droppings, insect remains and urine streaks. Activity surveys were conducted from dusk. Bat activity was recorded using a heterodyne detector. The Mall River corridor and offsite areas, specifically Templemore Lake and woodlands were the focus of the survey. Bats were identified by their ultrasonic calls coupled with behavioural and flight observations.

### Birds

Populations of birds using/ potentially breeding on the site were assessed by carrying out a walkover survey on May 9<sup>th</sup> 2014. Species were identified by calls and sightings by an experienced bird surveyor. The methodology broadly followed BirdWatch Ireland countryside breeding bird survey methodologies and appropriate methods detailed in Gilbert *et al.* (1998).

The Mall River was surveyed for riparian and water bird species in particular Kingfisher (listed Annex 1 Birds Directive), Grey Wagtail, Moorhen and Dipper.

#### 6.2.3 Survey Constraints

No significant constraints existed to conducting the updated ecological surveys which were carried out during the main botanic and breeding bird season (May, June and July 2014). Protected mammals such as otter are also readily detectable at this time.

#### 6.2.4 Consultation

##### Department of the Environment, Community and Local Government (DoECLG)

A consultation letter was issued on the 4<sup>th</sup> June 2014 by TOBIN Consulting Engineers to the Development Applications Unit (DAU) of the Department of Arts, Heritage and the Gaeltacht (DAHG). No response has been received to date. A consultation response from the DAU to the previous proposed Templemore Flood Relief Scheme in 2008 highlighted the following:

- Best practise with regard to pollution control and siltation prevention should be implemented;
- No protected flora records exist for the works area; and
- The works may potentially impact Templemore Wood proposed Natural Heritage Area (pNHA) and breeding and resting sites for otter. Suitable mitigation for adverse impacts to the pNHA and a survey for otter habitat are recommended.

<sup>4</sup> National Roads Authority, 2005. Best Practice Guidelines for the Conservation of Bats In the Planning of National Road Schemes.

<sup>5</sup> Kelleher, C. & Marnell, F. (2006) Bat Mitigation Guidelines for Ireland. *Irish Wildlife Manuals*, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.



A phone conversation was held with Stefan Jones, District Conservation Officer with National Parks and Wildlife Service (NPWS), on 16<sup>th</sup> June 2014. He noted the potential to impact salmonids, crayfish, otter and lamprey and commented on the need for a salvage operation and mitigation measures such as silt curtains and fuel bunds to ameliorate downstream impacts. He further noted the presence of the pNHA and the potential to disturb the birds using the lake, and that there may be a possibility of Kingfisher using the area.

#### Inland Fisheries Ireland (IFI)

A consultation letter was issued to IFI on the 4<sup>th</sup> June 2014 by TOBIN Consulting Engineers. A consultation response was received from the IFI stating that in principle they support the proposal to establish a new river channel including the establishment of appropriate in-stream and riparian habitat. They state:

- The detailed design of the new channel will be agreed in consultation with the IFI;
- No works shall be carried out without prior consultation and agreement with the IFI;
- The IFI welcome the development of proposals for linear parkland / river walks, particularly in urban areas;
- The proposal for a new river walk, while well intended is inappropriate as it is immediately adjacent to the proposed diversion channel;
- IFI is of the view that the proposal should include a riparian zone of approximately 10m;
- IFI requires at least two weeks notification of the intention to divert the Mall River to the new channel so that the removal and transfer of fish from the existing channel to the new channel can be planned; and
- Diversion into the new channel can only take place during the period July to September inclusive.

#### *6.2.5 Evaluation and Impact Assessment Criteria*

The assessment was undertaken in accordance with the guidance contained in the document *Guidelines for Ecological Impact Assessment in the United Kingdom* (IEEM, 2006), with reference to *Guidelines for Assessment of Ecological Impacts of National Roads Schemes* (NRA, 2009). These documents detail the procedure for establishing the 'value' of ecological habitats (i.e. international, national, regional, high local, moderate local, low local) and the criteria for assessing the significance of predicted impacts (i.e. severe, major, moderate, minor or no impact). Table 6-1 overleaf details the NRA evaluation scheme (NRA, 2009) for sites.

**Table 6-1 Site Evaluation Criteria**

<b>Ecological Valuation</b>	
Internationally Important	<p>Sites designated (or qualifying for designation) as an SAC or SPA under the EU Habitats or Birds Directives;</p> <p>Undesignated sites that fulfil criteria for designation as a European Site;</p> <p>Features essential to maintaining the coherence of the Natura 2000 network;</p> <p>Sites containing 'best examples' of the habitat types listed in Annex I of the Habitats Directive;</p> <p>Resident or regularly occurring populations of birds listed in Annex I of the Birds Directive and species listed in Annex II and/or Annex IV of the Habitats Directive;</p> <p>Ramsar Site;</p> <p>World Heritage Site;</p> <p>Biosphere Reserve;</p> <p>Site hosting significant species populations under the Bonn Convention;</p> <p>Site hosting significant populations under the Berne Convention;</p> <p>Biogenetic Reserve;</p> <p>European Diploma Site;</p> <p>Salmonid water.</p>
Nationally Important	<p>Sites or waters designated or proposed as an NHA*;</p> <p>Statutory Nature Reserve;</p> <p>Refuge for fauna and flora protected under the Wildlife Acts;</p> <p>National Park;</p> <p>Undesignated sites fulfilling criteria for designation as a NHA; Statutory Nature Reserve; Refuge for Fauna and Flora protected under the Wildlife Act and/or a National Park;</p> <p>Resident or regularly occurring populations (assessed to be important at the national level) of species protected under the Wildlife Acts and/or species listed on the relevant Red Data list;</p> <p>Site containing viable areas of the habitat types listed in Annex I of the Habitats Directive.</p>
County Importance	<p>Areas of Special Amenity;</p> <p>Area subject to a Tree Preservation Order;</p> <p>Area of High Amenity, or equivalent, designated under the County Development Plan;</p> <p>Resident or regularly occurring populations (assessed to be important at the County level) of species of birds listed in Annex I of the Birds Directive, species listed in Annex II and/or IV of the Habitats Directive, species protected under the Wildlife Acts and/or species listed on the relevant Red Data list;</p> <p>Site containing area(s) of the habitat types listed in Annex I of the Habitats Directive that do not fulfil criteria for valuation as of International or National Importance;</p> <p>County important populations of species, or viable area of semi-natural habitats or natural heritage features identified in the National or local BAP;</p> <p>Sites containing semi-natural habitat types with high biodiversity in a county context and a high degree of naturalness, or populations of species that are uncommon within the county;</p> <p>Sites containing habitats and species that are rare or are undergoing a decline in quality or extent at a national level.</p>

**Ecological  
Valuation**

Local Importance (higher value)	<p>Locally important populations of priority species or habitats or natural heritage features identified in the Local Biodiversity Action Plan (BAP);</p> <p>Resident or regularly occurring populations (assessed to be important at the Local level) of species of birds listed in Annex I of the Birds Directive, species listed in Annex II and/or IV of the Habitats Directive, species protected under the Wildlife Acts and/or species listed in the relevant Red Data list;</p> <p>Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or populations of species that are uncommon in the locality;</p> <p>Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.</p>
Local Importance (lower value)	<p>Sites containing small areas of semi-natural habitat that are of some local importance for wildlife;</p> <p>Sites of features containing non-native species that are of some importance in maintaining habitat links.</p>

Source: Guidelines for Assessment of Ecological Impacts in National Road Schemes (NRA, 2009)

Impacts are discussed and assessed in relation to impact type (positive, neutral or negative), character and sensitivity of the affected feature, magnitude, duration, timing and frequency. Criteria for assessing impact and magnitude are presented in Table 6-2 and 6-3 respectively.

**Table 6-2 Criteria used in Ecological Impact Assessment (EPA 2002, IEEM 2006, EirGrid 2012)**

<b>Positive or Negative:</b>	Is the impact likely to be positive or negative? International and national policy now pushes for projects to deliver positive outcomes for biodiversity.
<b>Context (Magnitude and extent):</b>	A scheme may affect only a small part of a site but the area of habitat affected in that location (in hectares) should be given in the context of the total area of such habitat available (e.g. 1 Ha of a woodland which measures 30 Ha in total.)
<b>Character:</b>	The type of habitat (e.g. natural or highly modified woodland; mature or recently established, wet or dry) is important, as is the quality of the site (e.g. undamaged active blanket bog).
<b>Significance:</b>	State whether a site has a designation, such as a SAC or MHA, or contains a listed (Annex I) habitat. The ecological value of a site can be assigned a rating using an evaluation scheme (e.g. undesignated areas of semi- natural broadleaved woodland are normally rated as high value, locally important).
<b>Sensitivity:</b>	Indicate changes that would significantly alter the character of an aspect of the environment (e.g. changes in hydrology of a wetland due to construction of access road).
<b>Duration:</b>	Indicate the time for which the impact is expected to last prior to recovery or reinstatement of impacted habitats and/or species. The duration of an activity may differ from the duration of the resulting impact caused by the activity (e.g. short-term construction activities may cause disturbance to birds during the breeding season, however, there may be longer –term impacts due to a failure to reproduce in the disturbed area during that season).
<b>Reversibility:</b>	Identify whether an ecological impact is permanent (non-reversible) or temporary (reversible – with or without mitigation).
<b>Timing and Frequency:</b>	Some changes may only cause an impact if they happened to coincide with critical life-stages or seasons (for example, the bird nesting season). This may be avoided by careful scheduling of the relevant activities.

**Table 6-3 Criteria for assessing impact magnitude (Gittings 1998)**

Impact Magnitude	Definition
No change	No discernible change in the ecology of the affected feature.
Imperceptible Impact:	A change in the ecology of the affected site, the consequences of which are strictly limited to within the development boundaries.
Minor Impact:	A change in the ecology of the affected site, which has noticeable ecological consequences outside the development boundary, but these consequences are not considered to significantly affect the distribution or abundance of species or habitats of conservation importance.
Moderate Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to significantly affect the distribution and/or abundance of species or habitats of conservation importance.
Substantial Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to significantly affect species or habitats of high conservation importance and to potentially affect the overall viability of those species or habitats in the wider area.
Major Impact:	A change in the ecology of the affected site which has noticeable ecological consequences outside the development boundary. These consequences are considered to be such that the overall viability of species or habitats of high conservation importance in the wider area is under a very high degree of threat (negative impact) or is likely to increase markedly (positive impact).

## 6.3 Existing Environment

### 6.3.1 Designated Conservation Sites

The NPWS database of designated nature conservation areas was reviewed. The database was searched for designated sites within 15km of the proposed scheme. In addition, sites potentially linked to effects of the development (e.g. downstream rivers) were considered. The proposed scheme works area does not fall within or adjacent to any designated site. Templemore Wood is not currently designated (it is a proposed Natural Heritage Area (pNHA) and lies close to parts of the proposed works). The nearest designated site is Kilduff, Devils Bit Mountain (Natural Heritage Area (NHA) / Special Area of Conservation (SAC)), which is located approximately 2.4km northwest of the proposed works area. The Lower River Suir (SAC) is approximately 22km downstream of the scheme and hence is linked to activities including the proposed scheme works in its catchment. Table 6-4 and Figure 6.1 overleaf present the designated areas located within 15km of the proposed scheme.

**Table 6-4 Nature Conservation Designations identified as potentially linked to effects of site works and within 15km.**

Site code	Status	Site name	Approx. distance from study area (km)
000942	pNHA	Templemore Wood	Adjacent to proposed works
000934	SAC and NHA	Kilduff, Devil's Bit Mountain	2.4km North-west
002066	pNHA	Ormond's Mill, Loughmoe, Templemore	4km South
001934	pNHA	Cabragh Wetlands	>11km South
002060	pNHA	Aghsmear House	12km North-east
002137	SAC	Lower River Suir	22km South-west (river distance)

**Note:**

SAC = Special Area of Conservation

NHA = Natural Heritage Area

pNHA = proposed Natural Heritage Area (non designated)

The NPWS site synopsis for all nature conservation sites within 15km of the proposed scheme are presented in Volume 3, Appendix 6.3. A description is provided (below) for Templemore Wood (pNHA) as this is adjacent to proposed works.

Templemore Wood pNHA (20.4 ha)

Templemore Wood pNHA is located close to the proposed scheme works area. This site encompasses an area of oak-ash-hazel woodland dominated by oak and ash with frequent elm *Ulmus* sp. and occasional hazel. This woodland is part of an old estate and exotic trees occasionally occur so that parts of the woodland are characterised by elements of (mixed) broadleaved woodland (WD1). Exotic species include beech (which is particularly frequent along the eastern margin), sycamore, horse-chestnut *Aesculus hippocastanum* and Sitka spruce *Picea sitchensis*. Although the lake appears to have been created artificially, it is characterised by abundant emergent aquatic vegetation and it is an important habitat for waterfowl, fish and aquatic invertebrates. An area of reed and large sedge swamp dominated by reed mace *Typha latifolia* occurs in the northern part of the lake, to the north of the northernmost island.

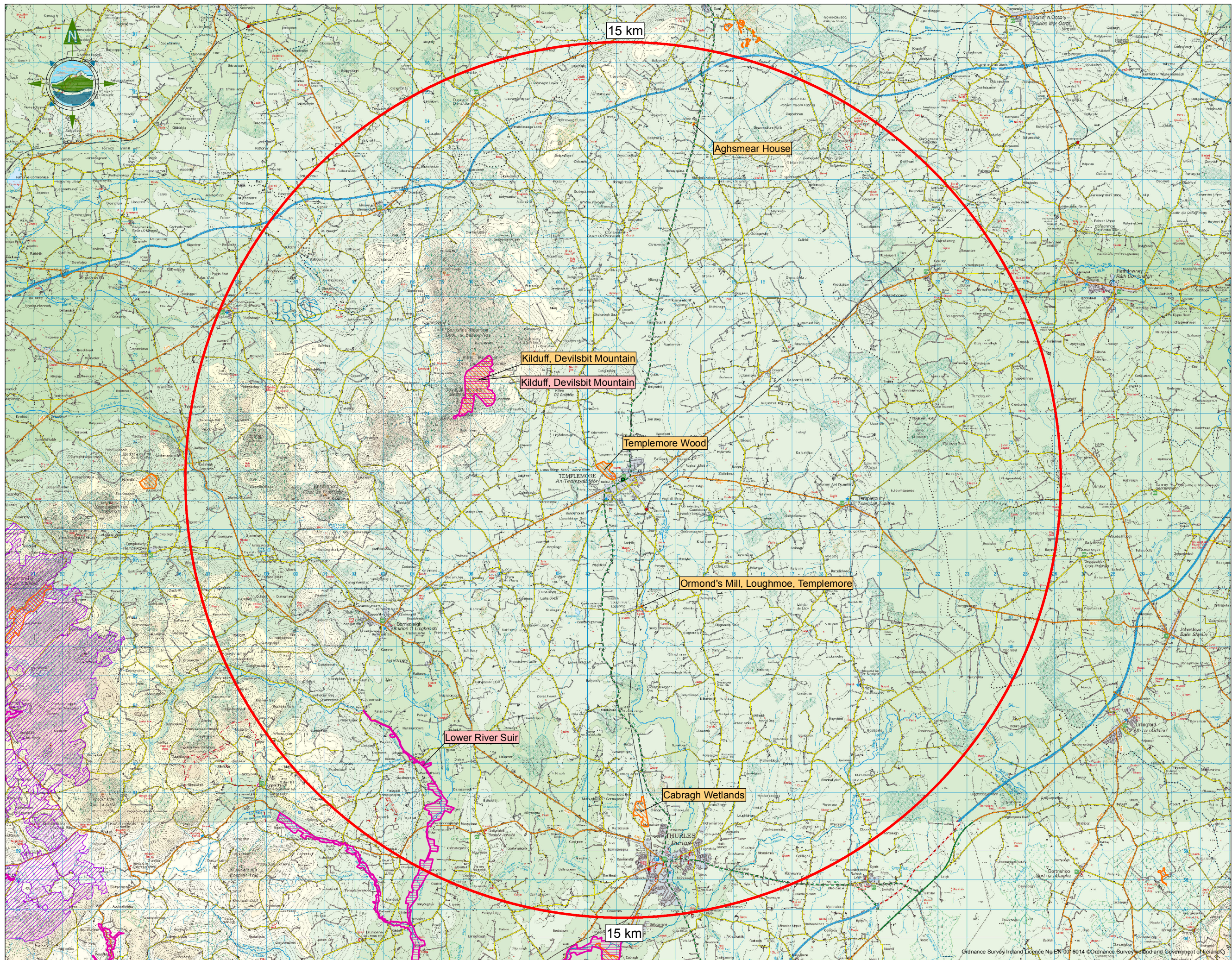
A Natura Impact Statement (NIS) (refer to Volume 3, Appendix 6.4) has been carried out due to potential impacts of the scheme on the Lower River Suir SAC. While the works are at a significant distance upstream of the Lower River Suir SAC (>22km) the NIS was produced given the possibility of aquatic qualifying interest species being impacted and therefore requiring mitigation consideration. This document is provided to inform the Appropriate Assessment conducted by the consenting authority






required under Article 6(3) and 6(4) of the European Habitats directive which is statutory legislation identified in various Irish regulations; refer to section 6.1 above.

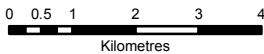
The NIS concludes that following implementation of precautionary water pollution control measures, it is considered that there would be no significant direct or indirect impacts, alone and/or in combination with other plans and projects on the integrity of relevant European Sites. Such mitigation measures include, but are not limited to, the production of a Construction Environmental Management Plan prior to commencement of works on-site, design and implementation of silt/sedimentation traps, surface water quality monitoring and supervision by an Ecologist.





**Legend**

-  SAC - Special Area of Conservation
-  SPA - Special Protection Area
-  pNHA - Proposed National Heritage Area



**NOTES**

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

A	16.07.14	Issued	G.F.	A.A.
Issue	Date	Description	By	Chkd.

Client:



Project:

TEMPLEMORE  
FLOOD RELIEF SCHEME  
EIS

Title:

DESIGNATED  
CONSERVATION  
AREAS

Scale @ A3: 1:120,000

Prepared by: G.Fil Checked: A. Austin Date: July 2014

Project Director: D.Grehan



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Figure 6.1



### 6.3.2 Habitat Assessment

The habitats identified within the proposed scheme works boundary are presented in Figure 6.2 'Habitat Map' and are described in subsequent sections.

This report details the habitats found within the works area of the proposed scheme. For the purposes of this section of the Chapter this area is referred to as 'the site'.

Habitat types identified within the site include:

- Eroding/Upland Rivers (FW1);
- Drainage ditches (FW4);
- Wet Grassland (GS4);
- Improved Agricultural Grassland (GA1);
- Scattered trees and parkland (WD5);
- Hedgerows (WL1);
- Treelines (WL2);
- Re-colonising bare ground (ED3); and
- Buildings and artificial surfaces (BL3).

The dominant habitat types present are wet grassland, buildings and artificial surfaces and improved agricultural grassland. Linear woodland fringes parts of the Mall River. Hedgerow/ tree-lines form field boundaries and are crossed by elements of the proposed development.

#### Eroding/Upland River (FW1)

The Mall River is discussed in more detail in the aquatic ecology assessment detailed in Chapter 7 of this EIS. It consists of a relatively fast flowing river with gravel and cobble substratum. Water is hard (limestone fed) and it eventually links into the River Suir. In-stream vegetation included fool's water cress *Apium nodiflorum*, fennel pondweed *Potamogeton pectinatus* and brooklime *Veronica beccabunga*. Riparian woody vegetation is extant along the banks of part of the river and includes typical hedgerow species including ash *Fraxinus excelsior*, hawthorn *Crataegus monogyna*, holly *Ilex aquifolium*, alder *Alnus glutinosa* and blackthorn *Prunus spinosa*. Vegetation growing on the bridge walls was also noted, this included; maidenhair spleenwort *Asplenium trichomanes*, red valerian *Centranthus ruber* and ivy leaved toadflax *Cymbalaria muralis*.

The Mall River retains a high degree of naturalness and a minimum of four Annex II listed European Union Habitat Directive faunal species including Salmon, Brook Lamprey, Freshwater Crayfish and Otter. It is therefore evaluated as being of high local ecological value.

#### Drainage Ditch (FW4)

Drainage ditches exist within wet grassland at the north of the site. These partly connect to the Mall River. They appear not to be regularly maintained as siltation has allowed wet grassland type vegetation to establish on the drain edges. Also noted are more aquatic species including duckweed, green algae, brooklime and fools watercress.

These areas are evaluated as being of low to moderate local ecological value.

#### Wet Grassland (GS4)

Wet grassland of varying ecological value can be found in three locations within the site:

##### **North West**

Fields, known locally as Shortt's Field, located at the northern section of the proposed culvert consist of wet grassland. This field appeared to be grazed by cattle and moderately poached. The area is moderately species rich and dominated by soft rush. Other species noted include compact rush *Juncus conglomerates*, silverweed *Potentilla anserina*, meadowsweet *Filipendula ulmaria*, marsh ragwort *Senecio aquaticus*, autumnal hawkbit *Leontodon autumnalis*, dock *Rumex* sp., creeping thistle *Cirsium arvense*, creeping bent *Agrostis stolonifera* and cocks-foot *Dactylis glomerata*. The bordering hedgerow understory is relatively diverse, containing meadow sweet *Filipendula ulmaria*, St. John's wort, *Hypericum tetrapterum*, speedwell *Veronica officinalis*, cow parsley *Anthriscus sylvestris* and mouse ear *Cerastium fontanum*. This area shows a degree of naturalness and has a low to moderate diversity of plant species. This habitat type is considered to be of moderate local ecological value.

##### **South**

A noteworthy wet grassland habitat is located south of Patrick Street, west of O'Dwyer's Bridge; this area is species rich and appears to have partly developed in an area with an infill or deposit of builder's rubble. Species noted include; mouse ear *Cerastium fontanum*, ox-eye daisy *Leucanthemum vulgare*, red clover *Trifolium pratense*, white clover *Trifolium repens*, spear moss, black medick *Medicago lupulina*, bird's foot trefoil *Lotus corniculatus*, field horsetail *Equisetum arvense*, purple loosestrife *Lythrum salicaria*, meadow buttercup *Ranunculus acris*, creeping thistle *Cirsium arvensis*, creeping cinquefoil *Potentilla reptans* and willowherb *Chamerion angustifolium*. The wet conditions support numerous grass and sedge species such as; meadow foxtail *Alopecurus pratensis*, meadow grass *Poa pratensis*, sweet vernal grass *Anthoxanthum odoratum*, Yorkshire fog *Holcus lanatus*, crested dog's-tail *Cynosurus cristatus*, hard rush *Juncus inflexus*, hairy sedge *Carex hirta*, carnation sedge *Carex panacea*, oval sedge *Carex ovalis* and remote sedge *Carex remota*.

There is evidence of tree succession in the centre of the field, with development of ash *Fraxinus excelsior*, sycamore *Acer pseudoplatanus*, willow *Salix* spp., and hawthorn *Crataegus monogyna* saplings. This tree line is developing on an area of builders rubble previously deposited on the site.

This area of wet grassland has high species diversity and is regarded as having moderate local ecological value.

### **South East**

Wet grassland habitat is located to the south east of the site, adjacent to Railway View housing estate would be regarded as having low ecological value. This habitat has some species indicative of marsh (GM1) but due to gravel infill it has reduced in size and vegetation diversity. Species noted include mare's tail, floating reed sweet grass *Glyceria maxima*, bulrush *Typha latifolia*, purple loosestrife *Lythrum salicaria*, silverweed *Potentilla anserina* and bindweed *Convolvulus arvensis*. This area appears to have been used as a dump as significant evidence of rubbish dumping exists. This area has relatively low species diversity and is highly modified. It is regarded as having low local ecological value.

### Improved Agricultural Grassland (GA1)/ Dry meadow grassy verge (GS2)

Improved agricultural grassland habitat occurs in the southern half of the works area. This habitat is cattle grazed, which has produced a short uniform sward where the dominant grass species is perennial ryegrass *Lolium perenne*. Some 'agricultural' herb species are present within the sward with creeping buttercup *Ranunculus repens* being the most abundant of these. Other species to occur include dandelion *Taraxacum* sp, meadow buttercup *Ranunculus acris*, clover *Trifolium* sp., daisy *Bellis perennis*, spear thistle *Cirsium vulgare*, ragwort *Senecio jacobaea*, common nettle *Urtica dioica* and docks *Rumex* sp.

A number of fields at the centre of the proposed works and adjacent to the southern culvert outflow have not been intensively managed in recent years and have become rank and overgrown. Species diversity is low though species composition is more diverse as broadleaved herbs are more common. These are generally common opportunistic species including sheep sorrel *Rumex acetosella*, thistle species *Cirsium* sp, knapweed species *Centaurea* sp and more atypical species of improved grasslands including marsh woundwort *Stachys palustris* and Autumnal hawkbit *Leontodon autumnalis*.

Overall this habitat is evaluated as being of low ecological value as it has been highly modified and has low species diversity.

### Scattered trees and parkland (WD5)

Scattered planted birch trees are present in amenity parkland to the south of Templemore Lake. This area is considered to be of moderate local ecological value.

### Hedgerows and Treelines (WL1/WL2)

Dense, diverse hedgerows (riparian woodland type) occur along much of the length of the Mall River. In addition to their floral species diversity, hedgerows are of value for their associated wildlife, including invertebrates, birds, bats and other mammals. These habitats act as important wildlife corridors linking the various woodland sites described above and connectivity should be retained as much as possible.

Hedgerow diversity is quite similar throughout the site. The main trees species present are ash *Fraxinus excelsior*, alder *Alnus glutinosa*, hawthorn *Crataegus monogyna* and elder *Sambucus nigra*. Other species to occur include sycamore *Acer pseudoplatanus*, hazel *Corylus avellana*, willow *Salix* and holly *Ilex aquifolium*. Bramble *Rubus* sp. is the most frequent under storey scrub to occur with occasional blackthorn *Prunus spinosa*, gorse *Ulex europaeus* and wild rose *Rosa* spp. Planted tree-lines of poplar species, *Leylandi*, Laurel *Prunus laurcerasus Rotundifolia* and Lawson cypress *Chamaecyparis lawsoniana* exist around houses in parts of the site.

The quantity of ground flora species present varies from hedgerow to hedgerow but essentially comprises of “agricultural” herbs and grasses including dandelion *Taraxacum officinale*, herb-Robert *Geranium robertianum*, creeping thistle *Cirsium arvense*, false oat grass *Arrhenatherum elatius*, velvet bent *Agrostis canina*, cleavers *Galium aparine*, cocksfoot *Dactylis glomerata*, common ragwort *Senecio jacobaea*, common nettle *Urtica dioica* and ivy *Hedera helix*. Other species noted in the hedgerow understory included; bind weed *Convolvulus arvensis*, bush vetch *Vicia sepium*, celandine *Ranunculus ficaria*, meadow sweet *Filipendula ulmaria*, lords and ladies *Arum maculatum*, common dock *Rumex*, cow parsley *Anthriscus sylvestris* and purple loosestrife *Lythrum salicaria*.

Hedgerows close to the Mall River are evaluated as being of moderate to high local ecological value, as they contain semi-natural habitat, are adjacent to the Mall River and are important for wildlife, particularly birds, feeding bats and otter. Other hedgerows/ tree-lines are considered to be of moderate local ecological value.

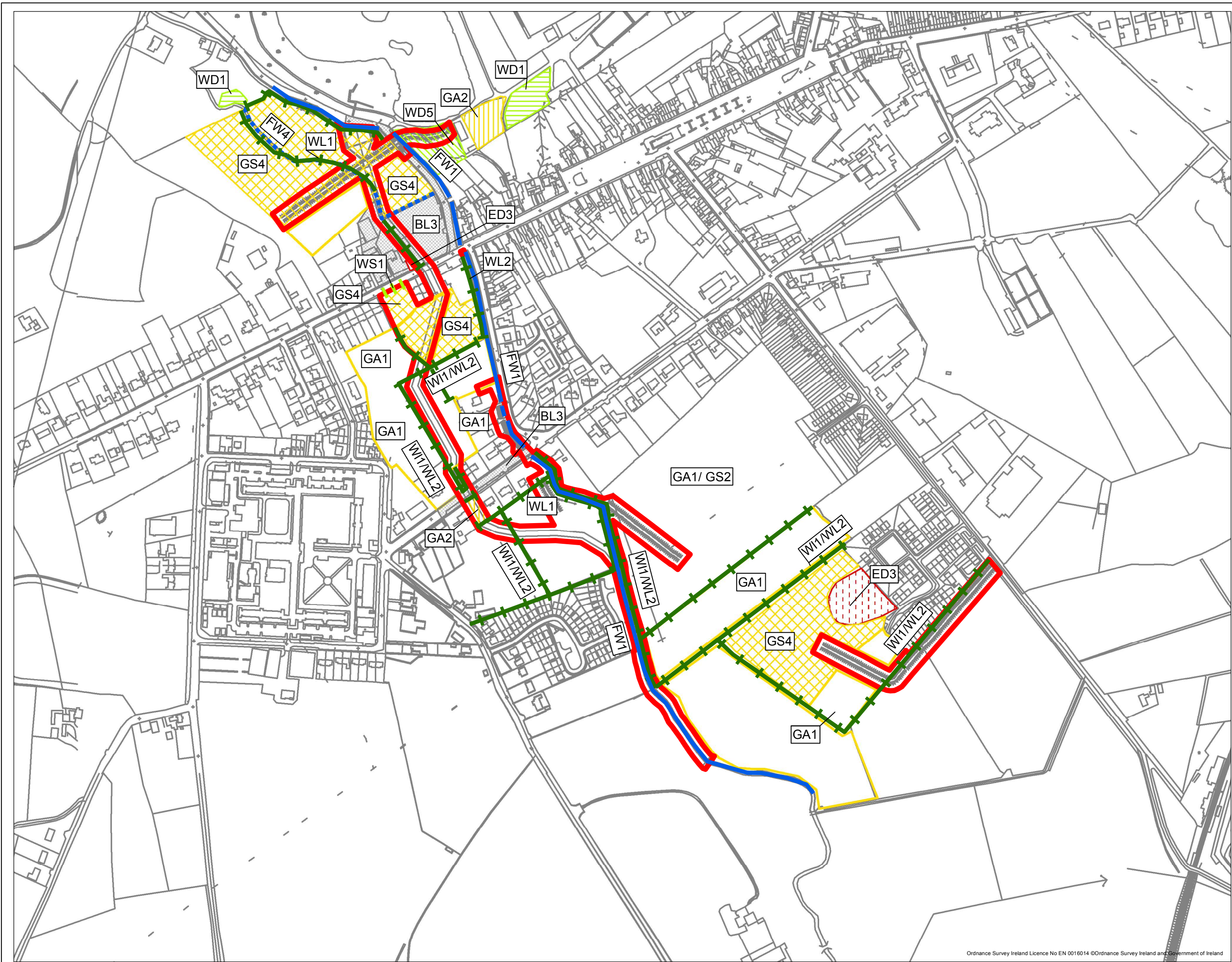
### Re colonising Bare Ground (ED3)

A small area of re-colonising bare ground is located on Patrick Street, at a field entrance. This area is partly vegetated with common grasses, horsetail, knapweed, ivy and bindweed. It is of low ecological value. This habitat can also be found adjacent to Railway View housing estate in the southern end of the site. This was previously categorised as GM1 Marsh. Due to gravel infill, used to alleviate flooding, the extent of the marsh area has decreased and is now non-existent. This area is of low ecological value.

### Buildings and Artificial Surfaces

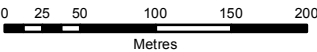
Much of the culverts will pass through built habitats of no significant ecological value.





Legend


- Proposed Culvert & other works
- FW1 Eroding/upland rivers
- FW4 Drainage ditches
- WL1/WL2 Hedgerows/ Treelines
- WS1 Treelines
- BL3 Building sand artificial surfaces
- ED3 Recolonising bare ground
- GA1 Improved agricultural grassland
- GS2 Dry Meadow/ Grassy Verges
- GA2 Amenity grassland
- GM1 Marsh
- GS4 Wet grassland
- WD1 (Mixed) broadleaved woodland
- WD5 Scattered trees and parkland



- NOTES
- 1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
  - 2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
  - 3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
  - 4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

A	13.11.08	Issued	G.F.	R.M.
Issue	Date	Description	By	Chkd.

Client:



Project:

TEMPLEMORE  
FLOOD RELIEF EIS

Title:

HABITAT  
MAP

Scale @ A3: 1:5,000		
Prepared by: G.Fil	Checked: R. MacNaughton	Date: July 2014
Project Director: D.Grehan		



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Figure 6.2



### 6.3.3 Rare and Protected Flora

According to the NPWS database of rare and protected flora, there are rare plant records for the two 10km grid squares crossed by the proposed route (i.e. S07 and S17). These are the small-white orchid *Pseudorchis albida* (recent record, 1991) and the green-winged orchid *Orchis morio* (old record, 1882) (refer to Table 6-5 below for details). The small-white orchid is afforded protection under the Flora Protection Order (1999), and both species are listed as vulnerable in the Irish Red Data Book (Curtis & McGough, 1988)<sup>6</sup>. The record of the small-white orchid is located approximately 8-9km from the study area. The old record of the green-winged orchid is not precise in its location and no unimproved meadows or pastures were found at the site during the course of a survey in 1991.

Neither of these species is likely to occur within the works area and none were found.

**Table 6-5 Rare plant records for 10km grid squares crossed by the proposed route**

Species	Conservation status	Year recorded	Details	Grid ref.	Habitat
Small-white orchid ( <i>Pseudorchis albida</i> )	Protected under FPO* (1999); listed as vulnerable in Irish RDB	1991	Devil's Bit, Kilduff	S0474	Locally abundant in heathy grassland and thin bracken
Green-winged orchid ( <i>Orchis morio</i> )	Listed as vulnerable in Irish RDB	1882	Templemore	S 17	No details

\* FPO = Flora Protection Order

\*\* RDB = Red Data Book

### 6.3.4 Faunal Assessment

#### Otter signs / tracks

No evidence of otters was recorded in the 2014 survey. In 2008 an otter spraint and otter print was observed 50m upstream and immediately downstream of O'Dwyer's Bridge respectively. In addition an otter spraint and slide was noted close to where the Mall River passes under the Blackcastle Road, close to Patrick Street. No evidence of breeding or resting sites were recorded along the entire Mall River within the proposed works footprint and downstream of here.

<sup>6</sup> Curtis, T. & McGough, H. 1988. *The Irish Red Data Book: 1 Vascular Plants*. Wildlife Service Ireland, Dublin. The Stationary Office.

### Otter Habitat Assessment

An assessment was conducted of potential otter habitat along the Mall River within the works footprint, Mall River downstream of works area to confluence with River Suir and Templemore Lake. A number of conclusions of this assessment are detailed below.

- The Templemore Lake habitats reed and large sedge swamp, willow scrub, other fringing mixed deciduous woodland and open water provide suitable habitat for foraging and possibly resting otter. Though low level disturbance exists from walkers and dogs, enough areas exist for nocturnal foraging.
- Mall River adjacent to Blackcastle Road. This area contains fringing riparian woodland and open wet grassland to the west. No holts were identified. This area provides suitable forage habitat and is undisturbed enough to provide temporary rest areas.
- Mall River under Blackcastle Road to under Church Avenue. Riparian vegetation is limited in this section. This area may be used for commuting and foraging (nocturnal) otter but is sub-optimal habitat.
- Church Avenue to southern connection to Mall River. Dense scrub riparian vegetation is extant along this section. No holts were identified. This area provides suitable forage habitat and is undisturbed enough to provide temporary rest areas for otter.
- South of reconnection of proposed culvert to Mall River within works footprint. Fringing riparian woody vegetation exists on the eastern bank for approximately 250m. A housing development abuts the western side and vegetation has been removed. Beyond 250m no riparian woody vegetation is present and the Mall River flows through improved grassland. This area may be used for commuting and foraging (nocturnal) otter but is sub optimal habitat due to a lack of riparian vegetation.
- Riparian woody vegetation reappears close to the confluence with the River Suir (Greenwood area) and this area provides optimal forage and shelter for otter.

### Bats

The results of both 2008 and 2014 surveys did not find any evidence of roosting bats in the vicinity of the site including bridge structures and riparian habitats which potentially will be disturbed by proposed works.

The 2014 survey confirmed the presence of foraging bats in the proposed site area. Species recorded included soprano pipistrelle *Pipistrellus* spp, common pipistrelle *Pipistrellus pipistrellus* and leisler's bat *Nyctalus leisleri*. Common pipistrelles, Soprano pipistrelles and Liesler's bats were all recorded in low densities in Templemore Park. All three species were additionally recorded along the river (Shortt's Bridge) and culvert adjacent to the park. Common and Soprano pipistrelles were recorded along the treelines and hedgerow in the wet grassland habitat located south of Patrick Street, west of O'Dwyer's Bridge. Common pipistrelles were recorded at Small's Bridge. There was no evidence of bats at the time of surveying at the Railway View Estate area.

A survey was conducted of the works area and the adjacent Templemore woods and lake on 17<sup>th</sup> September 2008. Bat species were confirmed within the survey area. Species noted included soprano pipistrelle *Pipistrellus* spp, common pipistrelle *Pipistrellus pipistrellus* and Daubentons *Myotis daubentoni*. An old castle offsite was noted as a probable bat roost with common pipistrelle bats noted at high densities at dusk and social calls detected. All bat species described were very common around the Templemore woodland and lake. Daubentons (minimum five individuals) were noted foraging over the lake. *Pipistrellus* spp. were noted in woodlands and treelines around the lake. Only common pipistrelle was noted within the works corridor foraging at low densities. No significant roost features were noted on site and no evidence of roosts was noted.

All Irish bat species are protected under the Wildlife Act (1976) and Wildlife (Amendment) Act (2000). Moreover, all bat species are protected under Annex IV of the EU Habitats Directive (1992).

#### Other Protected Fauna

An Irish hare was sighted in wet grassland in the southern section of the scheme during the June 2014 site surveys. No badger setts were recorded and all hedgerows and other potential breeding sites were surveyed which may be impacted. In addition no red squirrel or other protected species were noted.

#### Common Mammals

Rabbit *Oryctolagus cuniculus* signs were noted off site in hedgerows adjacent to improved pasture.

No other signs of mammals were recorded although the habitats present on site may provide suitable habitat for hedgehog *Erinaceus europaeus*, wood mice *Apodemus sylvatica* and pygmy shrew *Sorex minutus*.

The National Biodiversity Data Centre website ([www.biodiversityireland.ie](http://www.biodiversityireland.ie)) has records of Greater white-toothed shrew, an invasive species, found in Barn owl pellets south of Templemore Lake. There are also records for bank vole trapped in the southwest of the town.

### Amphibians and reptiles

Common frog *Rana temporaria* was sighted in wet grassland south of Main Street. Smooth newt *Triturus vulgaris* may potentially use the site though none were noted. Potential breeding sites include an area of marsh and drainage ditches in the northern section of the works area. Amphibians are protected under the Wildlife Acts (1976 and 2000). The common frog is also listed in the Red Data Book. No signs of viviparous lizard were noted.

### 6.3.5 Birds

A breeding bird survey was carried out in May 2014. Species recorded were predominantly common species not of conservation concern and included; jackdaw *Corvus monedula*, pied wagtail *Motacilla alba yarrellii*, robin *Erithacus rubecula*, long tailed-tit *Aegithalos caudatus*, chaffinch *Fringilla coelebs*, chiffchaff *Phylloscopus collybita*, starling *Sturnus vulgaris*, woodpigeon *Columba palumbus*, blackbird *Turdus merula*, willow warbler *Phylloscopus trochilus*, wren *Troglodytes troglodytes*, great tit *Parus major*, blue tit *Cyanistes caeruleus*, house sparrow, dunnoek *Prunella modularis*, blackcap *Sylvia atricapilla*, and rook *Corvus frugilegus*. Grey wagtail *Motacilla cinerea* was the only riparian species recorded. A male was noted at Cloone Bridge downstream of the site works area. Grey Wagtail is currently a Red-listed Bird of High Conservation Concern in Ireland (source: BirdWatch Ireland).

No Kingfisher breeding sites or sightings were recorded in the Mall River.

A Barn owl *Tyto alba*, was sighted in July 2014, flying in a southerly direction over the Railway View Estate area. Barn owls are a Red-listed Bird of High Conservation Concern in Ireland and are listed as a Species of European Conservation Concern.

All birds and their nesting places are protected under the Irish Wildlife Act (1976) and under the Irish Wildlife Amendment Act (2000), (except for excluded species). It is an offence to kill, trap or harm these birds. It is also an offence to wilfully disturb these birds on or near a nest containing eggs or unfledged young.

### 6.3.6 Key Ecological Receptors

Key ecological receptors considered regarding potential impacts from the proposed scheme are detailed below.

### Designated Conservation Areas

There are three NHA / pNHAs located within 5km of the site (refer to Table 6-4). No impacts are likely to Kilduff, Devilsbit Mountain (cSAC and NHA) and Ormond's Mill (pNHA).

Templemore Wood pNHA is of National importance and may potentially be impacted by the development of the scheme. Mitigation by avoidance of direct impacts and careful work construction practises described in Section 6.6 *Mitigation Measures* will aim to avoid impacts to this area and associated species.

The Lower River Suir SAC occurs approximately 22km downstream of the proposed development works area. The SAC consists of the freshwater stretches of the River Suir immediately south of Thurles. The Suir and its tributaries flow through the counties of Tipperary, Kilkenny and Waterford. The full site synopsis is included in Volume 3, Appendix 6.3.

The Lower River Suir SAC is designated for 15 Qualifying Interests. These are detailed below with their current overall conservation status (NPWS, 2013). No specific conservation objectives have been publicised for this SAC therefore where applicable the conservation objectives for the River Nore and River Barrow the conservation objectives have been used and are referred to where relevant later in the report.

#### Qualifying Features of Interest:

- Freshwater pearl mussel (*Margaritifera margaritifera*) [1029] - UNFAVOURABLE BAD
- White-clawed crayfish (*Austropotamobius pallipes*) [1092] - UNFAVOURABLE INADEQUATE
- Sea lamprey (*Petromyzon marinus*) [1095] - BAD
- Brook lamprey (*Lampetra planeri*) [1096] - FAVOURABLE
- River lamprey (*Lampetra fluviatilis*) [1099] - FAVOURABLE
- Twait shad (*Alosa fallax*) [1103] - INADEQUATE BAD
- Salmon (*Salmo salar*) [1106] - UNFAVOURABLE INADEQUATE
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] - UNFAVOURABLE INADEQUATE
- Otter (*Lutra lutra*) [1355] - GOOD
- Mediterranean salt meadows (*Juncetalia maritimi*) [1410] - UNFAVOURABLE INADEQUATE
- Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitriche-Batrachion* vegetation [3260] - UNFAVOURABLE INADEQUATE
- Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels [6430] - BAD
- Old sessile oak woods with *Ilex* and *Blechnum* in British Isles [91A0] - UNFAVOURABLE BAD
- \*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) [91E0] – UNFAVOURABLE BAD
- \**Taxus baccata* woods of the British Isles [91J0] - UNFAVOURABLE BAD

Potential impacts to the Lower River Suir are considered in the NIS report in Volume 3, Appendix 6.4.

#### Habitat Evaluation

Habitats identified within the site are summarised in Table 6-6 together with their evaluation rating (NRA 2009) and whether they are considered a key ecological receptor. Buildings and artificial surfaces and improved grassland habitat occupies the greatest area within the site and are not of significant ecological value.

**Table 6-6 Habitats Identified and Evaluation**

Habitat Classification	Evaluation	Key Ecological Receptor
River Mall - Eroding Upland Rivers including adjacent riparian woodland (hedgerows)	Local Importance (Higher Value)	Yes
Drainage ditches (FW4)	Low to Moderate Value, Locally important	No
Wet Grassland (GS4)	Moderate Value, Locally Important	No
Improved Agricultural Grassland (GA1)	Low Value, Locally Important	No
Hedgerows (WL1) and Tree-lines (WL2)	Moderate Value, Locally important	No
Scattered trees and parkland (WD5)	Moderate Value, Locally Important	No
Re-colonising bare ground (ED3)	Low Value, Locally Important	No
Spoil and bare ground (ED2)	Low Value, Locally Important	No
Buildings and artificial surfaces (BL3)	Low Value, Locally Important	No

No rare or protected flora or fauna were found within the site boundary.

### Fauna Evaluation

The site is utilised by otter (signs noted in 2008 survey only) which is protected under Irish and EU legislation (Annex II EU Habitats Directive listed species). However, no breeding sites were noted in the works area and no signs at all were recorded in 2014. In this regard, the Mall River provides sub optimal forage habitat and wildlife corridor. Despite no breeding areas, otter are considered likely to forage on the Mall River (use it as commuting corridor) and hence are considered a key ecological receptor.

While Grey wagtail and Barn owl (Red Listed Bird Species of High Conservation Concern) occur in the area they are not considered key ecological receptors as potential breeding sites area well removed from the proposed works area and possible effects of the development.

### Summary Key Ecological Receptors

The key ecological receptors determined include:

- Mall River (refer to Chapter 7 for further detail);
- Templemore Wood (pNHA): and
- Otter.

Aquatic fauna including salmon, white clayed crayfish and brook/river lamprey and eel are dealt with in Chapter 7.

## 6.4 Potential Impacts

Two flood relief scheme scenarios were considered in this ecology assessment:

- A. The river will be left in its current channel route, with the new channel taking only flood flows; and
- B. The river is diverted in full to the new channel.

A summary of the main identified impacts for both scenarios are:

- Disturbance to vegetation in the Mall River Corridor and wider works area;
- Permanent modification of stream habitat and other habitats in the works area;
- Potential pollution runoff;
- Invasive species introduction; and
- Disturbance to fauna.



These are discussed below in more specific detail as relevant to sensitive ecological receptors identified.

#### *6.4.1 Designated Sites*

There are six nature conservation designated sites located within 15km of the site (refer to Table 6-4). No impacts are likely to Kilduff Mountain (cSAC and NHA), Cabragh Wetlands (pNHA), Aghsmear House (pNHA) and Ormond's Mill, Loughmoe, Templemore (pNHA). A Natura Impact Statement has been prepared with respect to potential impacts to the designated features of the Lower River Suir SAC.

Templemore Wood (pNHA) is of National importance and occurs immediately adjacent to proposed embankments proposed in an area of amenity parkland to the south of the site. Mitigation is detailed in Section 6.6 and will include the avoidance of direct impacts to this site. In addition construction work practises will aim to avoid/ minimise indirect impacts such as silt runoff and disturbance to this area and associated species.

#### *6.4.2 Key Ecological Receptors*

Potential impacts to key ecological receptors are detailed in Table 6-7 overleaf.

**Table 6-7 Potential Impacts to Key Ecological Receptors**

Area/ Habitat	Works	Impact Description	Impact
Templemore Wood (pNHA).	New embankments proposed in parkland immediately south of the pNHA.	Lake and riparian areas may potentially be impacted by the development of this scheme as embankments are proposed in the area of amenity parkland to the south of the lake. Water pollution and disturbance to sensitive habitats.	Short Term Minor Impact. No impacts are expected post construction.
<b>Eroding upland river:</b> Mall River and associated riparian woody vegetation.	<p>Scenario A: New flood channel (805m) would divert water from original channel during a flood event only with a flow of <math>5.5 \text{ m}^3 \text{ sec}^{-1}</math> retained in the Mall River. River flow retained in River Mall outside flood events.</p> <p>Scenario B: Reduction / permanent removal of current water flows in Mall River. Localised loss of riparian trees, hedgerows and other vegetation in the areas where the new flood channel joins the Mall River. River habitat, possibly, retained with low flow.</p>	<p>Scenario A: Localised loss of riparian trees, hedgerows and other vegetation in the areas where the new flood channel joins the Mall River. River habitat retained with low flow. Original channel is maintained. Sedimentation impacts along channel likely due to upstream works.</p> <p>Scenario B: Localised loss of riparian trees, hedgerows and other vegetation in the areas where the new flood channel joins the Mall River. Permanent loss of aquatic and in-stream habitats along original section of river to be bypassed (700m approximately) with new channel; as river flow removed.</p> <p>Woody vegetation retained along Mall River except where culvert connects to the River Mall. Infilling of approximately 80m of the Mall River channel proposed immediately south of the Templemore Lake outfall.</p>	<p>Scenario A: Temporary (construction stage) localised minor negative impacts to existing river habitats where new culvert access works required in existing river channel. Post construction no measurable impacts expected.</p> <p>Scenario B: Localised, permanent moderate to substantial negative impact in terms of river habitat loss along section of Mall River bypassed.</p> <p>No measurable impacts expected to river habitat upstream and downstream of the diversion where river flows will not be altered.</p>

<b>Otter</b>	Refer to Eroding Upland River above.	<p>Scenarios A &amp; B: Temporary disturbance to commuting corridor during construction stage. Loss / reduction in abundance of prey species (fish, Crayfish, Eels) due to pollution and other ecological changes to river habitat associated with reduced flow. No loss of breeding sites likely.</p> <p>The new culvert may be less attractive for commuting and foraging as it will be less vegetated and more prone to disturbance though nocturnal use is likely to continue.</p>	<p>Scenarios A &amp; B: Short Term Minor negative Impact associated with disturbance during the construction stage particularly during in-stream and riparian vegetation removal works. Otter are predominantly nocturnal and mobility should not be impacted as works will not take place at night. They are also adaptable and should be able to continue commuting along the Mall River corridor during the works phase. Following in-stream works riparian vegetation will redevelop in the new channel and fish and other prey species will be more readily accessible, as is the case in similar works of this nature.</p>
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#### 6.4.3 Other Ecological Receptors

As described earlier, the proposed flood relief scheme involves the creation of a new channel for permanent diversion of the Mall River with associated culverts, deposition areas and embankments. New riparian and river habitat will be created in the new channel. Short-term construction impacts will include access routes to the work sites and temporary stockpiling of materials. Temporary noise and dust impacts during construction are also likely. A summary of potential impacts is detailed in Table 6-8 overleaf.

**Table 6-8 Impacts to Habitats**

Area/ Habitat	Works	Impact Description	Impact
<b>Wet grassland fields:</b> <ul style="list-style-type: none"> <li>Shortt's Field, adjacent to Blackcastle Road</li> <li>South of Patrick Street Garage</li> <li>West of Railway View Estate</li> </ul>	Construction of a new channel with associated culverts, weir, gravel trap grassed spillway, transition channel and new embankment. Deposition areas in Shortt's Field and South of Patrick Street Garage.	<p>Direct permanent impacts to Shortt's Field &amp; south of Patrick Street – In both locations modification/ removal of ca. 0.5 ha wet grassland. Deposition areas of ca. 1 ha.</p> <p>Indirect temporary impacts - construction stage noise &amp; disturbance.</p>	<p>Moderate permanent negative impacts during works phase.</p> <p>Minor permanent impact post works due to reduction in area of moderate value habitat.</p>
<b>Drainage ditches:</b> Shortt's Field	To be incorporated as part of new channel.	Temporary loss of drainage ditch vegetation.	<p>Minor negative in the short term. Similar vegetation will recover in the new channel.</p> <p>Imperceptible impacts post works.</p>
<b>Improved grassland:</b> In south of Templemore to south of Small's Bridge and in vicinity of the Railway View Estate	New channel and embankment construction.	Modification of low value habitat associated works detail.	<p>Minor negative in the short term.</p> <p>Imperceptible impacts post works.</p>
<b>Scattered trees and parkland:</b> South of Templemore Lake	Construction of embankment.	Minor short term damage/ removal of several trees.	<p>Minor negative in the short term.</p> <p>Imperceptible impacts post works.</p>
<b>Hedgerows and treelines</b>	Removal of hedgerow sections for construction of culvert and embankments throughout scheme area.	Areas within the works footprint (channel and embankment plus 8m either side) will be removed. Total estimated loss is 1325m.	<p>Moderate negative impacts during works phase.</p> <p>Minor negative impacts post works with mitigation (see below).</p>
<b>Recolonising bare ground / Spoil and bare ground / Buildings and Artificial Surfaces</b>	Low Value, locally important.	Transitional habitats will be removed and created during scheme development.	<p>Minor negative in the short term.</p> <p>Neutral impacts post works.</p>

#### 6.4.4 Rare Flora

Two species of rare or protected flora have been recorded in the same 10km grid square S02 as the site. Conditions on site are thought to be unsuitable for Small-white orchid (*Pseudorchis albida*) and Green-winged orchid (*Orchis morio*). No records of these or other protected flora exist on the NPWS database. No specimens of these plants were recorded on site and habitat is unsuitable so it is therefore considered there will be no impact from the proposed future works.

#### 6.4.5 Fauna

##### **Protected mammals**

No significant impacts are likely to bats as no roost sites were determined which will be directly impacted and key foraging areas noted, including Templemore Lake and woodland areas, will not be impacted. In addition forage areas will not be disturbed significantly during the night when bats feed.

No significant impacts beyond short term minor disturbance will occur to common species determined including fox and rabbit.

##### **Amphibians**

There will be modifications to relatively small sections of drainage ditch habitat at the north of the site. These impacts are likely to be of minor importance for breeding frogs given; small areas impacted and extensive alternative habitat. No impacts are likely to smooth newt as wet grassland/ marsh habitat in the south east of the site will not be directly impacted.

##### **Birds**

All birds and their nesting places are protected under the Irish Wildlife Act (1976) and under the Irish Wildlife Amendment Act, (2000) though there are exempted developments. A licence is generally required from the National Parks and Wildlife Service under the Wildlife Acts 1976 and 2000 if any habitat (e.g. scrub, trees, hedgerows) to be removed is known to contain nesting birds. If this work is undertaken outside the breeding season (i.e. 1st March to 31st August), then such a licence would not be required and would ensure compliance with the Wildlife Act 1976 and Wildlife (Amendment) Act 2000.

Impacts are expected to be short term minor to birds during the works phase through loss of hedgerow (nesting) habitat and disturbance provided vegetation removal is undertaken outside of the bird breeding season. Post works impacts will be neutral with implementation of mitigation measures.

## 6.5 Mitigation Measures

### 6.5.1 Key Ecological Receptors

Direct negative impacts will be avoided to Templemore Wood (pNHA) as works are outside the site boundary.

The edge of the proposed embankment beside Templemore Lake will be a minimum of 5m from the boundary. No material will be stored in this buffer zone which consists of amenity grassland (low ecological value) and scattered trees. Water pollution avoidance and minimisation measures (refer to Chapters 7 *Aquatic Ecology* and 9 *Water* of this EIS) during the construction phase, will aim to avoid indirect impacts such as silt runoff to Templemore Lake.

### 6.5.2 Riparian (Mall River) and Other Habitats

Hedgerow, tree-line and woodland vegetation that is to be retained will be clearly marked and fenced off to avoid accidental damage during excavations and site preparation. No materials should be stored within 5m of retained hedgerows/trees/woodland. Materials, especially soil and stones, can prevent air and water circulating to the roots of trees/shrubs.

The proposed works method statement will be reviewed by an experienced Ecologist. Site monitoring will be conducted by an Ecologist so as to advise regarding pollution controls, fish management, minimising localised tree clearance impacts, habitat reinstatement (replanting) and conducting updated pre works otter and bird surveys.

### 6.5.3 Otter

Otter potentially use the Mall River and Templemore Lake for foraging and commuting.

Measures to be used to protect aquatic ecology during the construction works will follow the relevant section of the NRA's documents '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' (NRA, 2005)<sup>7</sup> and '*Guidelines for the treatment of otters during the Construction of National Road Schemes*' (NRA, 2006)<sup>8</sup>.

During vegetation clearance along drains and the Mall River, an Ecologist will resurvey this area. If a holt is found, appropriate mitigation following NRA *Guidelines for treatment of otters prior to construction of road schemes* (NRA 2006) will be implemented. These will include assessing breeding activity within the site and a license application to the NPWS, if required. The Mall River corridor will not

<sup>7</sup> NRA (2005) Guidelines for the crossing of watercourses during the construction of national road schemes. National Roads Authority.

<sup>8</sup> NRA (2006b) Guidelines for the treatment of otters during the Construction of National Road Schemes. National Roads Authority.

be blocked off especially at night. This will allow otters to transit between areas north and south of the works. This is particularly important in Templemore Town as there will be increased risk of collision with cars if they cannot follow the river.

#### *6.5.4 Non Key Ecological Receptors*

Loss of potential forage habitat (riparian woodland and sections of hedgerow) during construction will be compensated by native tree planting, the mix of which will be similar to existing tree/ shrub species. This will allow the maintenance of existing treeline/ hedgerow wildlife corridors in the mid to long term (post construction), minimising risk of negative impacts to bats.

Similar habitats in the surrounding farmland will also provide alternative feeding areas during the construction phase.

#### Breeding Birds

It is recommended that woody vegetation removal be undertaken outside of the main bird nesting period which begins on March 1<sup>st</sup> and continues until August 31<sup>st</sup>.

All birds and their nesting places are protected under the Irish Wildlife Act (1976) and under the Irish Wildlife Amendment Act, (2000) though there are exempted developments. A licence is generally required from the National Parks and Wildlife Service under the Wildlife Acts 1976 and 2000 if any habitat (e.g. scrub, trees, hedgerows) to be removed is known to contain nesting birds. If this work is undertaken outside the breeding season (i.e. 1st March to 31st August), then such a licence would not be required and would ensure compliance with the Wildlife Act 1976 and Wildlife (Amendment) Act 2000.

#### Hedgerows/ riparian woodland and grassland habitats

Following the construction phase, replanting using native woody vegetation of local provenance, currently existing on site will be implemented, where hedgerow and riparian vegetation removal was significant. Where this is likely to recover, natural re-colonisation is preferable.

Sections of the new embankments will be planted with unimproved grassland species of local provenance to promote biodiversity.

Any hedgerows damaged by proposed works will be replanted where possible with species including a mix of ash, alder, willow, hawthorn, hazel, blackthorn and holly. Where appropriate sections of the new embankments may be planted with low growing native woody vegetation such as Hazel, Blackthorn or Hawthorn.



## 6.6 Conclusions

The key ecological impacts associated with the development of the proposed flood relief scheme are effects on aquatic ecology; refer to Chapter 7 *Aquatic Ecology*.

In terms of terrestrial ecology including river habitats, the key conclusions (including any residual impacts) are detailed below.

Direct negative impacts will be avoided to Templemore Wood (pNHA) as works are outside the site boundary. No works are proposed for Templemore Lake and no impacts on this water body are predicted.

Terrestrial (riparian) habitats will be largely retained along the Mall River in both scenarios. Scenario B will lead to loss of flow and permanent change to in-stream river habitat along approximately 700m. The creation of the new channel will compensate this effect in both scenarios though Scenario A is preferable from a terrestrial ecology context (retention of river habitat).

Otter will likely continue to use the old channel and/ or new channel for commuting and foraging as they are predominantly nocturnal when disturbance is not likely to occur.

Short term temporary disturbance are likely to occur to other local fauna including mammals, amphibians and birds during the works phase although impacts are not likely to be significant.

There will be direct permanent impacts to areas of wet grassland in Shortt's Field and south of Patrick Street. Habitat loss is likely to occur at this location due to use as a deposition area during the works, but a degree of habitat recovery may take place post construction around the new channel.

Loss of riparian woodland and sections of hedgerow during construction will be compensated by natural re-growth or if required native tree planting, the mix of which will be similar to existing tree/ shrub species. The existing riparian woodland strip along much of the Mall River in the vicinity of the works footprint will be retained except where ongoing maintenance work is required.

## 7 AQUATIC ECOLOGY

### 7.1 Introduction

ECOFAC Environmental Consultants were commissioned by TOBIN Consulting Engineers to carry out an Aquatic Ecology Impact Assessment of proposed flood relief works on the Mall River in Templemore.

The assessment concerns the baseline aquatic ecology within the Mall River in terms of individual aquatic species and aquatic ecological communities. Preparation of this study included both a desk study and a field survey of the site and surrounding areas. References used for this desk study are presented in Volume 3, Appendix 7-1. Fieldwork for the current assessment was undertaken during July 2014, and followed on a previous study undertaken in September 2008. There were no seasonal constraints in undertaking this assessment and the work was undertaken during ideal survey conditions of low water levels.

### 7.2 Study Methodology

The preparation of this assessment included an ecological site survey of the Mall River upstream and downstream of the proposed diversion and also within the affected stretch of river in order to characterise habitats and aquatic ecological features present. In total, seven locations were subject to aquatic assessments; one site on the River Suir main channel, one site on the Mall River downstream of the Oldtown River confluence, two sites on the Mall River downstream of the proposed works, two sites within the affected stretch of the Mall River and one site on the Mall River upstream of the proposed scheme works (refer to Volume 3, Appendix 7-2). The entire Mall River corridor from upstream of the scheme to the River Suir confluence was also walked. Table 7-1 presented in Volume 3, Appendix 7-2, gives the aquatic ecology survey locations. Volume 3, Appendix 7-3 presents photographs taken during the assessment at each of the survey locations.

#### 7.2.1 Habitat Assessment

An assessment of the aquatic habitat was carried out at the aquatic survey sites using the methodology given in the Environment Agency's '*River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003*' (EA, 2003). Each site was assessed in terms of:

- Width and depth and other physical characteristics;
- Substrate type, listing substrate fractions in order of dominance, i.e. large rocks, cobble, gravel, sand, mud etc;
- Flow type, listing percentage of riffle, glide and pool in the sampling area;

- In-stream vegetation, listing plant species occurring and their percentage coverage of the stream bottom at the sampling site (as applicable) and on the bankside; and
- Estimated cover by bankside vegetation, giving percentage shade of the sampling site.

Aquatic plants as well as rare and/or protected plant species and non-native flora were recorded at each site. Plant species nomenclature follows Stace '*New Flora of the British Isles*' (1997).

The results of the physical habitat study were used in conjunction with the leaflet '*The Evaluation of habitat for Salmon and Trout*' to assess habitat suitability for salmonids. This leaflet (Advisory leaflet No. 1) was produced by the Department of Agriculture for Northern Ireland Fisheries Division and was designed for use in the EU salmonid enhancement programme.

An opinion of lamprey habitats was made within the study area with reference to National Parks and Wildlife Service (NPWS) Irish Wildlife Manuals lamprey surveys (O'Connor, 2004; O'Connor, 2006; and O'Connor, 2007). A bathyscope was used to aid underwater observation of habitats/substrates. The results of the physical habitat study were used in conjunction with the publication '*Ecology of the River, Brook and Sea Lamprey*' (Maitland, 2003) which details the life cycle of lampreys including their spawning habitat requirements.

Habitat for macroinvertebrates was assessed using Barbour and Stribling (1991) where bottom substrate, habitat complexity and various other physical features were considered in assessment of sites for their suitability for macroinvertebrate production.

### 7.2.2 Electrical Fishing

Electrical fishing was carried out during normal / low water levels during July 2014. Electrical fishing assessments were carried out under authorisation from the Department of Communication, Energy and Natural Resources under Section 14 of the Fisheries Act (1980).

Electrical fishing specifically for salmonids was carried out at each site following the methodology outlined in the Central Fisheries Board (now Inland Fisheries Ireland) guidance "Methods for the Water Framework Directive - Electric fishing in wadable reaches". A portable electrical fishing unit (Smith Root-LR 24 backpack or Marine Electrics Safari) was used during this semi-quantitative assessment. Fishing was carried out continuously for a set period at each site and captured fish were collected into a container of river water. The boundary of the surveyed area at each location comprised a bank of the river, and where possible other features that limited fish from swimming from the survey area were utilized as boundaries (e.g. exposed rock, high gradient riffles in the channel). Stop nets were also used to enclose the survey areas. Fish species other than salmon and trout were also recorded. Following completion of the fishing, the dimensions and physical habitat characteristics of the site were recorded.

Juvenile lamprey surveys generally followed the methodology for ammocoete surveys given in the manual 'Monitoring the River, Brook and Sea Lamprey, *Lampetra fluviatilis*, *L. planeri* and *Petromyzon marinus* by Harvey & Cowx (2003). Electrical fishing for juvenile lampreys was carried using 1m<sup>2</sup> sub-site enclosures. In each case the enclosures were located in the most optimal juvenile lamprey habitats that could be found. All captured lampreys and other fish were identified and counted. Identification followed the manual 'Identifying Lamprey. A Field key for Sea, River and Brook Lamprey' by Gardiner (2003).

Captured fish and lampreys were collected and placed into containers of river water after individual surveys and were anaesthetised using a solution of 2-phenoxyethanol and measured to the nearest mm on a measuring board. Subsequent to this the fish were allowed to recover in a container of river water. All fish were released alive and spread evenly over the sampling area. Results of the investigations are presented using Catch per Unit Effort (CPUE) indices; fish number/m<sup>2</sup> and fish number/minute fishing.

### 7.2.3 White-clawed crayfish

White-clawed crayfish surveys were carried out under licence from NPWS (Licence C059 / 2014). Methodology for White-clawed crayfish surveying followed recognised procedures (hand searching and sweep netting) given in the manual 'A technical manual for monitoring white-clawed crayfish *Austropotamobius pallipes* in Irish lakes' by Reynolds *et al* (2010).

Hand searches were carried out with a bathyscope. A total of 100 potential refuges (ten patches each with ten potential refuges) were investigated at each location where a crayfish survey was undertaken. Habitat considered to offer the best potential refuges was selected at each site. Potential refuges are places that can shelter crayfish and include underneath rocks, logs, holes in banks, crevices between stonework in weirs and in-stream objects such as tyres etc. Following the examination of each refuge, the refuge type, where applicable was reinstated to its original position insofar as possible e.g. rocks repositioned to their original location and orientation. Boulders greater than 30cm were not moved during hand searching due to the possibility of damage to crayfish and their refuges. The catch of crayfish was expressed as a number per 100 refuges.

Records were taken of all captured White-clawed crayfish at each site (numbers of crayfish, life stage, and method of capture). Any unusual anatomical features such as a missing cheliped was noted or if a specimen had recently moulted. For juvenile and adult crayfish, total length TL (excluding claws) was measured using a vernier callipers. TL is from the tip of the rostrum to the end of the telson (tail). Hatchlings were not measured due to their frailty. White clawed crayfish of TL ≤ 15mm were classed as hatchlings. Crayfish in the length range 16-50mm were recorded as juveniles and specimens having a total length of greater than 50mm were classed as adults, in accordance with Reynolds (2006).

#### 7.2.4 Biological Sampling

Semi-quantitative sampling of benthic (or bottom dwelling) aquatic macroinvertebrates was undertaken at selected sites using kick-sampling (Toner *et al*, 2005). Stone washings and vegetation sweeps were also undertaken to ensure a representative sample of the fauna present at each site was collected. The Quality Rating (Q) System (Toner *et al.*, 2005) was used to obtain a water quality rating for each site.

### 7.3 Existing Environment

At the time of the current survey, the watercourses are lower than normal following a long dry period. The Environmental Protection Agency (EPA) recommends that biological sampling be carried out in these conditions since it is at these times that watercourses are most vulnerable to pollution. These flows in combination with bright conditions were also ideal for carrying out habitat assessments, electrical fishing surveys and white-clawed crayfish surveys. The results of the surveys undertaken at each site are given below, and provided in a list of Tables (Tables A7.1 to A7.9) presented in Volume 3, Appendix 7-2. Survey site locations examined on the Mall River and River Suir in July 2014.

#### 7.3.1 Site 1

Site 1 was located on a stretch of the River Suir in the environs of Pennane Bridge. This stretch of the River Suir is approximately 4km downstream of the N62 Bridge crossing of the Mall River in Templemore. At Pennane Bridge, the River Suir is a 4<sup>th</sup> order watercourse and is fed by the Aughall River approximately 20m upstream of Pennane Bridge.

#### **Habitat assessment**

The River Suir at Pennane Bridge had a wetted width of approximately 5m. The mean depth of the river at Pennane Bridge was 25cm. There was little variation in depth across the river. This part of the river had little physical diversity and the dominant flow feature was glide/pool. The banks of the river were sloped at an angle of approximately 60° and were heavily vegetated and stable. Discrete areas of the river were shaded from trees/scrubs growing along the banks.

The River Suir at this location flows through rich agricultural lands. Instream vegetation was dominated by filamentous algae *Cladophora* sp. which grew to a few meters in length where flow conditions allowed. Such profuse growth indicates enrichment. Some aquatic moss *Fontinalis* sp. was seen growing on rocks. This part of the river is regarded as suboptimal for the early life stages of salmonids due to limited riffled habitat. It is considered best suited to the rearing of salmonids as it provides cover in the form of overhanging bankside vegetation and in-stream rocks. Habitat for macroinvertebrates in this part of the River Suir is deemed suboptimal given the polluted conditions and poor pool quality.

### **White-clawed crayfish**

White-clawed crayfish occur in the River Suir in the environs of Pennane Bridge. A single juvenile crayfish was recorded during biological sampling at Pennane Bridge. Habitat suitable for adult (beneath rock and cobble) and for hatchling/juveniles (submerged bank side vegetation and cobbles), occurred along this part of the river. However, a full crayfish survey was not undertaken. The presence of hatchling crayfish at this location indicates that this stretch of the river is used by breeding adults.

### **Biological sampling**

Macroinvertebrates in 17 different families were recorded in the River Suir at Pennane Bridge. By and large, the macroinvertebrate community at this location consisted of pollution tolerant taxa. Group C pollution tolerant mayfly larvae of *Ephemera ignita* and *Baetis rhodani* were common. The only pollution sensitive indicator recorded at this location was the mayfly *Ecdyonurus dispar* which was scarce. Group B less sensitive indicators were limited to larvae of *Leuctra* sp. and cased caddisfly larvae of the Limnephilids *Potamophylax* sp. and *Limnephilus* sp. Caseless Trichopterans recorded were *Hydropysche* sp. and *Rhyacophila dorsalis*, listed by the EPA (Toner *et al*, 2005) as pollution tolerant indicators. *Gammarus deubeni* was numerous at this location while another crustacean, the White-clawed crayfish *Austropotamobius pallipes* was present. The macroinvertebrate assemblage at this site also comprised larvae of true flies (Simuliidae, Green chironomids), the beetle *Elmis* sp. and molluscs (*Ancylus fluviatilis*, *Potamopyrgus jenkinsi*, *Pisidium* sp.)

Based on the macroinvertebrate community and other criteria (habitat suitability, macrophyte growth, siltation, algal growth), biological water quality at this site was rated Q3-4, equivalent to Water Framework Directive (WFD) Moderate status. It is noted that this site is borderline Q3 taking into account significant algal growth and relative abundance of pollution sensitive indicators.

#### **7.3.2 Site 2**

Site 2 was located on the Mall River upstream of Cloone Bridge. This 3<sup>rd</sup> order reach of the Mall River has been deeply drained but has recovered to some degree. The 2<sup>nd</sup> order Oldtown River joins the Mall River approximately 0.5km upstream of Cloone Bridge (downstream of the part of the Mall River directly affected by the proposed scheme).

### **Habitat assessment**

The stretch of the Mall River upstream of Cloone Bridge is a low-medium gradient stretch. Banks on both sides of the river were approximately 2.5m high and the cross sectional shape of the channel was typically trapezoidal, evidence of drainage works in the past. This stretch of the watercourse had a wetted width of approximately 4m. The substrate in the river was a mix of rock, cobble, gravel and fines in nearly equal proportions. It was noted that the substrate was heavily silted. Flows were characterised by short riffle/glides linking shallow pools. In-stream vegetation comprised aquatic moss *Fontinalis* sp.

and filamentous algae *Cladophora* sp. Some sparse stands of water crowfoot *Ranunculus* sp. were also present.

This stretch of the Mall River is most suited to the early life stages of salmonids, rocks and riffles providing cover and protection from predators. It is likely to be used to some degree by spawning trout and salmon also. This part of the river is deemed suboptimal for adult trout (and salmon) given the lack of deep pools favoured by larger fish (along with the relatively small stream size). Rocks in this part of the river provide suitable habitat for crayfish. Habitat for macroinvertebrates is considered to be suboptimal overall due to marginal habitat complexity.

### **White-clawed crayfish**

White-clawed crayfish occur in the Mall River at Cloone Bridge. A total of nine crayfish were recorded during hand searching survey where 100 potential refuges were examined (CPUE = 0.09). The primary habitat for this species was underneath rock and cobble substrate. There was little emergent vegetation along this part of the river, a niche preferred by hatchling juvenile crayfish.

A total of seven adult crayfish and two juveniles were recorded at this location. The age structure of the crayfish population at this location suggests that this part of the river is sub-optimal for the species.

### **Biological sampling**

A macroinvertebrate family diversity of 19 was recorded at Cloone Bridge on the Mall River. The benthic faunal assemblage was dominated by pollution tolerant indicators across a range of taxa. Mayfly larvae of Group C *Ephemerella ignita* and *Baetis rhodani* were common and numerous respectively. The only Group A taxon recorded was the heptagenid mayfly *Rhithrogena semicolorata* which was scarce. The most diverse order was the Trichopterans with five cased species (*Potamophylax* sp., *Limnephilus* sp., *Sericostoma personatum*, *Agapetus fuscipes*, *Silo pallipes*) and two caseless species (*Hydropysche* sp., *Rhyacophila dorsalis*) recorded. Fair numbers of the snails *Ancylus fluviatilis* and *Potamopyrgus jenkinsi* were recorded.

Using the EPA freshwater biological monitoring system (Toner *et al*, 2005), this site was rated Q3-4, equivalent to WFD Moderate status. This rating has been assigned tentatively given the low abundance and occurrence of only species of pollution sensitive indicator. However, based on visual observations this site would be borderline Q4.

#### **7.3.3 Site 3**

Site 3 was located on the Mall River at Manna south, approximately 0.6km downstream (south) of the N62 Bridge in Templemore. This stretch of the river has been recently maintained by dredging and



riparian areas have been affected by bank clearance. The highly modified nature of the channel has significantly affected its aquatic ecological value.

### **Habitat assessment**

The wetted width of the Mall River at Site 3 was approximately 3.3m. This part of the river has intermediate gradient and is artificially wide, the mean depth of the channel being in the order of only 10cm. The maximum recorded depth along the surveyed stretch was only 30cm. The substrate in this stretch was mainly of gravel, with smaller proportions of cobble and finely deposited materials. Banks of both side of the river were denuded of riparian vegetation in places, with evidence of continuing erosion in certain places along the right bank. This part of the river had monotonous physical characteristics and was deemed a marginal habitat for all life stages of salmonids. Similarly, habitat suitability for macro invertebrates was considered poor, with considerations for bottom substrate, habitat complexity, pool quality, bank stability, bank protection and canopy cover.

### **Electrical fishing**

Electrical fishing was carried out over a 100m length of this part of the Mall River over a period of 20 minutes. The area fished was approximately 330m<sup>2</sup> and only brown trout *Salmo trutta* (N=4) were recorded. These fish ranged in length from 12.8cm to 13.7cm and were deemed to be 1+ group fish. The catch per unit effort (CPUE) indices for trout were 0.2 fish/minute and 0.012 fish/m<sup>2</sup>. Salmonid habitat along this stretch of the Mall River has been negatively affected by recent maintenance works and the low minimum density of trout recorded is a reflection of the damage to aquatic habitats.

There was no suitable habitat for juvenile lampreys in the surveyed stretch at Manna South; probably as a result of the recent drainage works.

### **White-clawed crayfish**

A total of one White-clawed crayfish was recorded in 100 potential refuges examined in the Mall River at Manna South (CPUE = 0.01). This crayfish was a juvenile of length 4.2cm. The potential refuges examined at this location were mostly cobbles and rocks. This species was not recorded during biological sampling, indicating the sparse distribution of crayfish in this highly modified part of the Mall River. In its current state, this part of the river is only a marginal habitat for any life stage of White-clawed crayfish.

### **Biological sampling**

A total of fourteen macroinvertebrate families were recorded at Site 3 on the Mall River. This stretch of the Mall River supported only less sensitive (Group B), pollution tolerant (Group C), very tolerant (Group D) and most tolerant (Group E) indicators. Mayfly larvae of *Ephemerella ignita* and *Baetis rhodani* were common. Cased caddisfly (Group B) larvae of *Agapetus fuscipes* were common with

*Sericostoma personatum*, *Limnephilus* sp. and *Potamophylax* sp. scarce. Caseless caddisfly (Group C) larvae of *Hydropysche* sp. and *Rhyacophila dorsalis* were present. Small numbers of pollution tolerant true fly larvae of Green chironomid and Simuliidae were recorded while Group E larvae of *Chironomus* sp. were present. Small numbers of the snails *Potamopyrgus jenkinsi* were recorded and *Ancylus fluviatilis* was scarce. *Gammarus deubeni* was dominant at this location.

The macroinvertebrate community at this location was indicative of unsatisfactory water quality and was rated Q3, moderately polluted, equivalent to Water Framework Directive (WFD) Poor status.

#### 7.3.4 Site 4

Site 4 was located on the stretch of the Mall River in the environs of Small's Bridge on the southern extents of Templemore. This part of the river is within the stretch directly affected by the proposed works. This part of the river flows along roadways and forms the boundaries of some dwelling properties. It is noted that bank side vegetation upstream of Small's Bridge had been recently cut/sprayed and that some resulting dead vegetation was present in-stream. Paragraph (1) (a) of section 40 of the Wildlife (Amendment) Act, stipulates that "*It shall be an offence for a person to cut, grub, burn or otherwise destroy, during the period beginning on the 1<sup>st</sup> day of March and ending on the 31<sup>st</sup> day of August in any year, any vegetation growing on any land not then cultivated*". It is clear that the clearance of vegetation along the Mall River upstream of Small's Bridge contravenes the section 40 of the Wildlife Act.

#### **Habitat assessment**

The Mall River in the vicinity of Small's Bridge had a wetted width of approximately 3.4m. The mean and maximum depth of the channel was 25cm and 40cm respectively. River substrate comprised almost equal proportions of rock, cobble gravel and fine material. Banks were in the order of 2m high with some walls set approximately 0.5m back from the bank upstream of Small's Bridge. This part of the river was characterised by long shallow glide and short riffle sequences, with some shallow pool habitat also present. This stretch of the river is likely to be used by spawning salmonids given the presence of some pool/glide habitat. Based on habitat, this part of the river was also deemed suitable for the early life stages of salmonids, with rocks providing ample cover for young fish. The few pools along this stretch were considered suitable for holding adult trout, especially those downstream of Small's Bridge. Diversity of bottom substrate and habitat complexity favour macroinvertebrate production in this stretch of the river but bank protection and shade conditions do not. Overall, habitat for macroinvertebrates in the environs of Small's Bridge was deemed suboptimal.

#### **Electrical fishing**

Electrical fishing was carried out over a channel length of approximately 100m corresponding to a surveyed area of 340m<sup>2</sup>. Four fish species were recorded during this 20 minute survey: Brown trout,

Atlantic salmon *Salmo salar*, European eel *Anguilla anguilla* and Pike *Esox lucius*. Brown trout were the most frequently occurring fish (N=35). The mean length of these trout was 15.6cm and ranged in length from 4.8cm to 27cm. Most of these fish were juveniles, indicating that this part of the river is an important spawning and nursery area. The minimum density of trout was 0.1 fish/m<sup>2</sup>, indicating that this part of the river holds a good stock of trout. A total of three juvenile salmon were recorded having an average length of 12.2cm. These fish were in the 1+ cohort and this part of the river is used to some degree by spawning salmon. Salmon are listed as a conservation interest of the Lower River Suir Special Area of Conservation (SAC) (downstream of Thurles) and are listed under Annex II and Annex V of the European Habitats Directive (S.I. No. 94/1997 - European Communities (Natural Habitats) Regulations, 1997).

One pike (juvenile) was recorded and measured 26cm long. Eel (N=3) ranged in length from 22.5cm to 38cm and were recorded in stony habitat and crevices under Small's Bridge. It is noted that European eel is listed as 'Critically endangered' and is now 'Red Listed' according to the recently published 'Red List No. 5: Amphibians, Reptiles & Freshwater Fish' (King *et al.*, 2011).

One juvenile brook lamprey *Lampetra planeri* was recorded in an area of 1m<sup>2</sup> during a specific survey for juvenile lampreys (length = 11.5cm). An area of 2m<sup>2</sup> depositing habitat deemed suitable for juvenile lampreys was also surveyed but these were not recorded in this area. Brook lamprey is listed as a conservation interest of the Lower River Suir SAC and listed under Annex II of the European Habitats Directive.

### **White-clawed crayfish**

Five crayfish were recorded in 100 potential refuges at this location: four adults and one hatchling (CPUE = 0.03). Potential refuges included the undersides of rock/cobble, underneath deadwood and in crevices in Small's Bridge. Crayfish were not detected during biological sampling indicating the sparse occurrence of the species in the surveyed area.

### **Biological sampling**

A relatively diverse macroinvertebrate assemblage was recorded in the Mall River at Small's Bridge. Macroinvertebrates in 19 families were found during biological sampling. The only pollution sensitive indicator recorded was mayfly larvae of *Rhithrogena semicolorata* which was scarce. Mayfly larvae of *Ephemerella ignita* and *Baetis rhodani* were common and numerous respectively. Caseless caddisfly larvae were generally recorded in small numbers and included *Sericostoma personatum* and *Limnephilus* sp. Larvae of the caseless caddisflies *Hydropysche* sp. and *Rhyacophila dorsalis*. True flies were well represented and this fraction of the macroinvertebrate community comprised *Simuliidae*, *Chironomidae*, *Thaumaleidae* and *Dicranota* sp. *Gammarus deubeni* was numerous and was the sole member of order Crustacea recorded at this location.

Using the EPA freshwater biological monitoring system (Toner *et al*, 2005), this site was rated Q3-4, equivalent to WFD Moderate status. This rating has been assigned tentatively given the low abundance and occurrence of only species of pollution sensitive indicator.

### 7.3.5 Site 5 / 6

Site 5 was located on the Mall River upstream of the N62 Bridge in Templemore Town. Site 6 was also located on this stretch of the river - upper end of same stretch as Site 5. This part of the river flows through an urban landscape and riparian habitats were seen to have been impacted by recent cutting of bank side vegetation. As previously mentioned, performing such un-necessary work is in breach of the Wildlife Act. It is noted that the only survey work carried out at Site 6 was electrical fishing for lampreys as it contained the only optimal lamprey habitat patch is the entire study area of the Mall River.

#### **Habitat assessment**

The Mall River upstream of the N62 Bridge had a wetted width of approximately 4.5m. The mean and maximum depth of the channel was approximately 20cm and 25cm in that order. A strip of vegetated soil occurred on the left side of the channel in some areas but the river banks proper (set back from riparian areas) were concrete, brick and stone walls. Some bedrock was present in this stretch but the bed of the river comprised mostly of gravel, sand and silt. This part of the Mall River was exposed owing to the lack of bank side trees and other riparian vegetation.

This stretch was regarded as a suboptimal rearing habitat for salmonids (some cover provided by rock and some riffled habitat) but may be used to some degree by spawning trout during the winter months. Habitat for macroinvertebrates was rated marginal with respect to the physical characteristics of the channel: habitat dominated by sluggish flow, fully exposed to light and poor pool quality. There was little/no suitable habitat for juvenile lampreys at Site 5. Some deposited silt at Site 6 was deemed suitable for juvenile lampreys.

#### **Electrical fishing**

Three fish species were recorded at Site 5 during a 10 minute electrical fishing operation over an area of approximately 270m<sup>2</sup>. Brown trout (N=19) ranged in length from 3.4cm to 16cm and had a mean length of 7.5cm. A large proportion of the brown trout were progeny of the most recent spawning effort indicating that this part of the river is used for trout spawning and rearing. The CPUE for brown trout was 1.9 fish/minute (minimum density of 0.07/m<sup>2</sup>). A single juvenile salmon was also recorded (length=13.9cm). Three spined stickleback (N=30) were also recorded at this location. Cutting of vegetation in the river along this stretch of the river is likely to have affected the abundance of the fish recorded.

At Site 6, an area of approximately 2m<sup>2</sup> was assessed for lampreys. A total of six brook lampreys were recorded in this area (minimum density of 3/m<sup>2</sup>). The surveyed area at this location was deemed optimal for lampreys, and was the only patch of optimal juvenile lamprey habitat in the area.

### **White-clawed crayfish**

Only one crayfish, a juvenile of length 3.4cm was recorded during hand searching at this site (CPUE=0.01). Crayfish were not detected at this site during biological sampling. A single adult crayfish was seen during electrical fishing, its refuge was a crevice in a wall/bank.

### **Biological sampling**

Macroinvertebrate family diversity at this location was 19. The assemblage was dominated by pollution tolerant taxa. Small numbers of pollution sensitive mayfly larvae of *Rhithrogena semicolorata* were recorded in a patch of riffled habitat. Larvae of *Baetis rhodani* and *Ephemerella ignita* were numerous and common in that order. Family Glossosomatidae of Trichoptera (cased caddisfly) were well represented with larvae of *Silo pallipes* (fair numbers) and *Agapetus fuscipes* (numerous) being recorded. The mollusc *Ancylus fluviatilis* was common and small numbers of the snail *Potamopyrgus jenkinsi* were recorded. The fish leech *Piscicola* sp. was also recorded at this site, indicating the use of this area by brown trout.

This site was rated Q3-4, equivalent to WFD Moderate status using EPA freshwater biological monitoring criteria.

### **7.3.6 Site 7**

Site 7 was located on the Mall River in the townland of Manna north, approximately 0.5km upstream of Templemore and upstream of the stretch of river directly affected by the proposed works. This stretch of the river flows through agricultural lands.

### **Habitat assessment**

The Mall River at Manna north is a low-medium gradient channel of wetted width approximately 2.8m. The mean and maximum depths of the channel were 20cm and 40cm respectively. The substrate was dominated by finer grade particles (80% gravel and 20% fine). There was evidence that this stretch of river had been deepened in the recent past with bank height generally in the order of 1.8m. This part of the Mall River was heavily shaded by trees/shrubs and in-stream vegetation was not recorded along the surveyed channel.

This stretch of the river was generally considered unsuitable/poor for spawning salmonids with respect to sluggish flows and substrate conditions. Parts of this channel had overhanging banks/vegetation

considered suitable refuges for juvenile salmonids. This part of the river was deemed a poor habitat for holding adult trout and unsuitable for holding salmon.

The benthic habitat of this stretch of the river was dominated by one structural component - fine material. Considering this and the lack of habitat complexity and pool quality, habitat for macro invertebrate production is deemed marginal.

### **Electrical fishing**

Electrical fishing was carried out over a channel length of approximately 60m corresponding to a surveyed area of 270m<sup>2</sup>. Two fish species were recorded during this 10 minute survey: Brown trout and Three-spined stickleback. Three-spined stickleback were the most frequently occurring fish (N=20). A total of 14 trout were recorded. The mean length of these trout was 15.7cm and ranged in length from 5.3cm to 22.6cm.

Four brook lampreys at juvenile stage were recorded corresponding to a CPUE of 0.25/m<sup>2</sup>.

### **White-clawed crayfish**

One adult crayfish of length 5.4cm was recorded during hand searching at this site (CPUE=0.01). This crayfish was found in a riverbank refuge. Crayfish were not detected at this site during biological sampling.

### **Biological sampling**

A total of nineteen macroinvertebrate families were again recorded at Site 7 on the Mall River. This stretch of the Mall River supported no pollution sensitive indicators. The assemblage consisted of larvae of mayfly *Ephemerella ignita* and *Baetis rhodani*, caddisflies *Potamophylax* sp., *Limnephilus* sp., and *Agapetus fuscipes*, true flies Simuliidae and Chironomidae and beetles *Helophorus* sp. and *Elmis* sp.

The macroinvertebrate community at this location was indicative of unsatisfactory water quality and was rated Q3, moderately polluted, equivalent to WFD Poor status.

## **7.4 Potential Impacts**

Two flood relief scheme scenarios were considered in this aquatic ecology assessment:

- A. The river will be left in its current channel route, with the new channel taking only flood flows;  
and
- B. The river is diverted in full to the new channel.

#### 7.4.1 Scenario A (using existing and new flood channel)

This option would result in the creation of a new flood overflow channel that would take flows during a flood event only. It is understood that the existing Mall River channel would take the first  $5.5 \text{ m}^3 \text{ sec}^{-1}$  in the river, with the rest of the water (up to  $16.13 \text{ m}^3 \text{ sec}^{-1}$ ) diverted through the new channel. It is envisaged that a small flow ("Sweetening Flow") would be allowed to continue down the flood channel during flows of  $5.5 \text{ m}^3 \text{ sec}^{-1}$  or less.

The new diversion channel will consist of a 805m long channel (with a 6.5m base width) that will begin in Shortt's Field and finish approximately 230m downstream of Small's Bridge. There will be a 60m-long inlet channel with Debris and Gravel Traps and a small Drop Weir. There will also be a requirement for re-grading of the channel from the new confluence to 740m below Small's Bridge. The re-profiled river section will run for approximately 480m downstream of the proposed confluence. The full-sized (7.5m) river-widening will run for 450m, followed by a transition of 250m (or so) back to the river's typical 4.5m base width. This option would also require 'maintenance' of the Mall River downstream of these works to the River Suir confluence.

It is understood that if this option is chosen that the channel will be designed as a flood conveyance channel only, and will not be enhanced for ecology or fisheries. However, the possibility of enhancing this channel, while continuing to meet the flood conveyance objectives, will be explored.

#### **Construction Phase**

This option would result in localised disturbances during construction works of the Mall River corridor at the points where the flood overflow channel would join the Mall River at the upstream and downstream end. In-stream works, including regrading of the river bed and rock armouring, would be required in these locations. Runoff could also occur from the excavations of the new flood channel, including from any stockpiles of excavated material and spoil repository areas. A concrete regulating weir would also be constructed at the upstream junction of the flood relief channel to regulate flows into the flood channel. These proposed construction works would have the potential to cause the release pollutants into the Mall River. Such pollutants would include uncured concrete, oils and construction debris. Machinery working within and near the river has the potential to produce pollutants both indirectly (from leaking fuels, oil spills, runoff from new channel construction area) and directly, as a result of the localised in-stream works (i.e. suspended solids, leaks from machinery etc.). Any pollutants or accidental spills could potentially run untreated into the Mall River and potentially the River Suir with serious negative consequences.

The proposed river scheme would potentially result in the physical removal of both habitats (i.e. spawning gravels, salmonid nursery areas) and protected species (crayfish, lampreys, salmonids) from the Mall River in the localised areas of the Mall River where the flood channel joins, including upstream



and downstream areas which will need to be re-graded and armoured. For salmonids, the ova and early juvenile stages are most sensitive. Although spawning takes place in winter, fry do not emerge until mid-late May. Therefore any in-stream works or releases of pollutants during the period October to May would potentially have an impact on salmonids. Brook lampreys spawn in the spring and early summer months. Juvenile lampreys remain in their nursery areas for up to five years and would therefore be potentially vulnerable to works. However the works are localised and would not be expected to directly affect any lamprey nursery habitats. Lamprey numbers are very low in the Mall River and in-stream works and/or releases of pollutants from the works areas during the lamprey spawning season could potentially impact on the status of this species in the river. White-clawed crayfish mate during late autumn and the female, remaining fairly inactive, incubates the ova for 8-10 months. Hatching takes place during June or July and the hatchlings remain attached to the female until their second molt. The hatchlings then become independent and the female resumes active feeding. Because of the long reproductive process, low fecundity (60-80 ova per year), and residential behaviour, this species would also be particularly vulnerable to localised direct impacts and indirect water quality impacts from the proposed works.

No exotic invasive flora was recorded from the study site however there is the potential for machinery working on the site to import non-native or invasive species from a previous work site into the river corridor.

There would also be a localised loss of riparian trees, hedgerows and other vegetation in the areas where the new flood channel joins the Mall River.

Sections of in-stream, bank side vegetation and hedgerows would also be cleared during the channel maintenance works downstream of the confluence of the new and existing channels, leading to a loss of aquatic and riparian habitats that have naturalised within Templemore Town and also downstream to the confluence with the Suir River.

As there would be no works on Templemore Lake there would be no direct effects on this water body. It is also unlikely that there would be any indirect effects on this water body.

### **Operational Phase**

Diversion of flows above  $5.5 \text{ m}^3 \text{ sec}^{-1}$  into the flood channel will essentially act as an abstraction to the stretch of the Mall River affected by the diversion. This could potentially impact the 'ecological status' of the stretch in a number of ways.

As the Mall River currently receives discharges from storm runoff and other sources, a reduction of flow in this river stretch:

- Will cause a reduction in its waste assimilation capacity. This could potentially result in the existing channel becoming more polluted as these discharges will now be more concentrated.
- Could, during flood events, potentially impact on hydro-geomorphological processes in the river affecting natural channel maintenance and sediment transport processes.

In Scenario A, it is envisaged that a flow ("Sweetening Flow") would be allowed to continue down the flood channel during flows of  $5.5 \text{ m}^3 \text{ sec}^{-1}$  or less. OPW (2014) has considered a value of  $0.5 \text{ m}^3 \text{ sec}^{-1}$  flow, which is a significant amount in terms of summer flow in the existing Mall River. This would effectively act as an abstraction from the Mall River and it would reduce flows in the river during normal and low flows. This could result in particularly severe impacts on the river during 90%ile and 95%ile flows, as the Mall River currently runs very low under drought conditions. A Flow Duration Curve (developed for the Hydrometric Station at Small's Bridge) estimates that flows greater than  $0.5 \text{ m}^3/\text{s}$  occur 27.3% of the time at Templemore. So, with a Sweetening Flow of  $0.5 \text{ m}^3/\text{s}$  in the Mall, river water in excess of this would flow in the diversion channel for a total of about 100 days, and clearly for a greater overall total in a wet year.

The Water Framework Directive Risk Assessment Working Group in Ireland has adopted a four category risk classification scheme (Anon, 2004). This scheme is presented below in Table A7.10 (refer to Volume 3, Appendix 7.2). The hydrological risk assessment threshold for rivers from the same report is provided in Table A7.11 (refer to Volume 3, Appendix 7.2). Based on these tables it would be required that the "abstraction" does not result in a change of more than 10% of the natural 95%ile flow in the river to ensure that the river maintains a status of at least Category 2a, or 'probably not at Risk'.

Using the UKTAG (2008) hydrological risk assessment methodology for salmonid spawning and nursery areas, the maximum permitted amount of change from the natural flow during flows of less than  $QN_{80}$  (natural 80%ile flow) during the period November to March is 7.5% for maintaining 'Good Ecological Status'. The corresponding maximum change permitted during the period April to October is 10%. The higher standard for the period November to March is primarily designed to protect spawning and early life history stages of salmonids.

However, it is noted that the affected stretch of river is less than 1km in length and the "abstraction" is not consumptive (i.e. the water is returned to the river downstream). Therefore the influence on the river of the diversion can be considered to be below a geographical scale where these effects would be considered significant on the water body. The Mall River currently does not have adequate flood conveyance capacity so the effect on hydro-geomorphological processes is unlikely to be significant. It is noted that the "Sweetening Flow" can be removed, and it is recommended that this is not used in this scenario as it has the potential to result in the affected stretch of the Mall River running too low during drought conditions.

When flows are being taken into the flood relief channel, fish and macroinvertebrates will be attracted into it and will drift down along it. When flood flows reduce, this would result in stranding of aquatic life. As this would be an ongoing effect, it would be potentially significant. Flood flows are more likely to occur during the winter months (the salmonid spawning season) and it is likely that a proportion of adult salmon and trout will be attracted into the flood channel and will spawn there. This would result in the ova/fry or indeed adults themselves being stranded in the flood channel. Salmon numbers in Mall River are already very low and an ongoing impact such as this could result in the loss of salmon from this component of the River Suir catchment. If a small percentage of the flow is allowed to flow down the new flood channel to reduce the possibility of fish, lamprey and macroinvertebrate becoming stranded there, then impacts will occur along the existing Mall River corridor, due to its reduced flows.

The proposed management of the scheme going forward will also involve the ongoing "maintenance" of the Mall River from the confluence of the flood channel down to the River Suir. This will have ongoing impacts on aquatic flora and fauna communities. These works in particular have the potential to impact on the brook lamprey and white-clawed crayfish populations of the river.

There would be no operational phase impacts on Templemore Lake.

#### *7.4.2 Scenario B (river is diverted into new channel)*

##### **Construction Phase**

Scenario B would have the same potential water quality impacts during the construction phase as outlined above for Scenario A. In addition, the flooding of the new channel would result in significant short-term water quality impacts when suspended solids and any contaminants on the bed of the new channel will be mobilised.

This scenario will result in the total loss of the existing Mall River channel on the diverted stretch, as a result of dewatering or infilling. This would result in the loss of most of the aquatic life along this stretch. Juvenile salmon, trout, brook lampreys and white-clawed crayfish would also be affected. Larvae of mayflies, caddisflies, true flies and beetles as well as adult beetles, snails and freshwater shrimp would be removed from the ecosystem. However, it is envisaged that fish, lampreys and crayfish would be translocated out of this stretch, therefore reducing the scale of the impact.

##### **Operational Phase**

The 'old' channel may be filled in and any storm water outfalls and discharges would be piped downstream and released into the Mall River at the junction of the 'old' channel and new channel. This would result in a number of discharges into the river becoming one point discharge. This may cause localised pollution of the Mall River downstream of the scheme due to the slight loss of assimilation capacity which would result from replacing a diffuse pollutant loading with a combined point discharge.

However, there is scope to also provide some water treatment here, and in particular the provision of an oil/water separator is recommended.

The proposed scheme will require the diversion of a number of services including foul and storm water diversions. At present a 600mm Combined Sewer Outfall (CSO) discharges to the Mall River adjacent to Smalls Bridge. While the frequency of discharge to the Mall River is unknown, it is understood to discharge storm flow from buildings, roads and hardstand areas to the west of Templemore Town. As no upgrade works are planned for the CSO, it is proposed to connect the CSO to the new diversion channel. The impact of the full diversion would have a negligible/neutral potential impact on the Mall River. CSOs typically coincide with periods of high river flows which would mitigate the potential impact however the discharge characteristics are not known for the CSO.

The outflow from Templemore Lake is into the affected reach of the Mall River, via a perched pipe. This pipe (and upstream sluice) is not considered to be passable by fish. However, under flood conditions, it is possible that some fish move from the lake into the Mall River and *visa versa*. It is likely that the pike that was recorded during the current survey came from the lake, for example. It is also possible that the culvert and sluice could currently become passable to fish moving in the opposite direction during floods; however, it is clear that significant upstream movement does not occur. Under Scenario B, the outfall from the lake is to be redirected to the new channel upstream of defences.

It is also being considered that the 'old' Mall River channel will be left open and it is envisaged by OPW (2014) that a flow of 0.5 m<sup>3</sup>/s would be left in the 'old' Mall River (a "Sweetening Flow"). This level of a flow is significant in terms of the low summer flows which the Mall River experiences. This would then result in an 'abstraction' from the new channel, and the hydro-ecological impacts on the new channel would be similar to those described for the existing Mall River in the impacts section for Scenario A above.

It is envisaged that the new channel would be designed to be a two stage channel with scope for significant aquatic ecological mitigation. The existing Mall River channel is highly modified and there is significant scope to provide a channel which is significantly superior in terms of physical and riparian diversity. In the medium term, this would bring significant benefits to aquatic and riparian ecology. Brown trout and white-clawed crayfish would benefit significantly from a salmonid type two stage "thawleg" type channel, as proposed. It is also recommended that specific measures be put in place to assist brook lampreys, which have different habitat requirements from salmonids. It is noted that "a 'Fish Channel' (*Thalweg*) will be dug and partially backfilled with gravels", this is unlikely to provide nursery habitat for brook lampreys and white-clawed crayfish. It is also noted that the channel will "be designed and constructed in consultation with the region's Fishery Board" when this may not be adequate to allow for features for lampreys and crayfish to be introduced into the channel. However, it

is clear that it would be very easy to provide much improved habitats when compared with the existing degraded and modified Mall River channel. It is noted that the use of a "Sweetening Flow" diverted into the 'old' channel will affect the ecological status of this new channel, as there will not be adequate water available for both channels in low flow / drought years.

Within the Engineering Report, it is stated that *"the small weir-like structure just upstream of the diversion is just 0.5m (or so) in height. Despite this, a Fish Pass may be necessary. This is a matter for the region's Fishery Board"*. It is noted that brook lampreys can neither jump or crawl over obstacles and a 0.5m drop will definitely be a barrier to movements to these species. It is also likely that a 0.5m drop will prevent upstream movements of eels and crayfish. If this is just a matter for the *"region's Fishery Board"*, it is possible that the requirements for lampreys, eels and crayfish at this location will not be met. Mitigation for these species is provided in this chapter, and it is recommended that a small rock ramp is installed below this drop to address the requirements of other non-salmonid fauna in the river.

## 7.5 Mitigation Measures

### 7.5.1 Scenario A (using existing and new flood channel)

#### **Mitigation by design**

It is recommended that the flood channel will be designed to have a consistent gradient with no areas of pooled water where fish may become trapped after a flood event. It will also be designed to ensure that there is no flow during normal operating circumstances; it will empty in its entirety. Following a flood event, any fish that may end up in the culvert can be expected to drop back to the main channel when flows recede. Although there will inevitably be some ongoing non-significant impacts in this regard.

The junction between the downstream end of the flood channel and the river should be designed to be a spillway with a drop. This will aim to prevent / discourage salmonids, eels, lampreys and crayfish ascending into the flood channel. The use of a physical barrier (i.e. screens) in this area is not considered feasible, as it would become clogged with debris. Likewise, there would be technical and practical difficulties in employing an electrical barrier at this site.

Flows into the upstream end of the flood channel will be controlled using a spillway designed to be at flood level.

It is possible that fish would drop over such a structure during a flood event however if the above design is followed this would not result in standing of fish. The upper end of the flood channel will also be designed in such a way that any fish accidentally entering the flood channel (i.e. adult salmon jumping the drop spillway, or any fish descending into the culvert during flood conditions) will be able to ascend

back through the upper spillway during a flood event. The provision of a physical, electrical or behavioural barrier in this area would also not be considered feasible. It is important that the detailed final designs be approved by Inland Fisheries Ireland (IFI) and the NPWS.

Where appropriate, riprap will be used instead of gabions for bank armouring works. The provision of rip rap has significant benefits for fish (O'Grady, 2006).

### **Mitigation by avoidance**

The timing of the works would be agreed in advance with the NPWS and Inland Fisheries Ireland (IFI). The works are located within a river corridor used by salmonids and lampreys for spawning. To protect salmon and trout it will be necessary to time works outside the window of October to May. Brook lampreys spawn in the spring and early summer months and the timing of works should also take this species into account.

Work areas will be limited as far as possible. No in-stream excavations or other works involving interference with the bed, bank or soil should take place outside of the immediate areas where the flood channel joins the Mall River.

No works are proposed for Templemore Lake and this area will be avoided during all construction works.

### **Mitigation by remedy**

The appointed contractor will be required to provide a detailed method statement showing how water quality impacts and habitat loss during the works will be minimised. The methodology will be approved by both the IFI and the NPWS prior to any works taking place. The requirement of any fish, lamprey and crayfish translocation operation will be discussed with a suitably qualified aquatic Ecologist. It is noted that crayfish cannot be captured effectively by electrofishing and lampreys cannot be removed using standard IFI fish salvage methods. A specialist contractor will have to be engaged to do this work.

A suitable Environmental Management System will be used to control sediments during the works; this will include the installation of properly designed silt curtains and a monitoring programme for suspended solids in the river, to be agreed with the NPWS and IFI.

Measures to be used to protect aquatic ecology during the construction works will follow the relevant section of the NRA's documents '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' (NRA, 2005). The fisheries board documents "*Maintenance and protection of the inland fisheries resource during road construction and improvement works. Requirements of the Southern Regional Fisheries Board*" (Kilfeather, 2007) and '*Requirements for the Protection of Fisheries*

*Habitat during Construction and Development Works at River Sites'* (Murphy, 2004) would also be followed where relevant.

Water quality impacts during the construction phase would be minimised / avoided by following a method statement agreed in advance with the NPWS and the IFI. A silt fence (or equivalent barrier) would be used to surround the works area. This would be installed in the river prior to any works commencing on site. Material removed would be stockpiled within a bunded area / or within a geotextile barrier. All necessary measures would be taken to prevent the release of oil, fuels or other pollutants into the Mall River. The works will be carried out during dry weather and halted during heavy rainfall to reduce suspended solids in the river. Spoil and removed vegetation material from the river is to be stored no less than 5m back from the river and vegetation within this 5m buffer zone is to be retained, in order to reduce the run-off of suspended solids back into the water course.

No exotic invasive flora was recorded from the study site however as the machines being used to excavate the river may contain fragments of exotic invasive flora they will be cleaned at the start of the excavation of the river.

Disturbed areas will be allowed to re-vegetate naturally. Particular care will be taken when working near mature trees in order to protect roots extending into the works site. Mature trees will be retained and scrub and hedgerow will be retained where possible. The minimum width required for machinery to operate safely will be used so that the least amount of vegetation will be removed.

During the works phase of the project the site will be monitored periodically by an Ecologist to ensure that the measures to protect water quality and aquatic areas are fully implemented by the contractor. The extent of monitoring required will be agreed in advance with the NPWS and the IFI and will be specified in the method statement.

#### 7.5.2 Scenario B (river is diverted into new channel)

##### **Mitigation by design**

The flood channel will be designed to be a physically diverse river corridor. Suitable guidance to follow is *'The New Rivers and Wildlife Handbook'* by Purseglove, J. (1995). The river channel should be designed with biodiversity in mind, and not just be aimed at salmonids. However, guidance for designing / enhancing rivers for salmonids can be found in the book *"Channels & Challenges. Enhancing salmonid rivers"* by O'Grady (1996) and elements of this book should also be used to inform the design of the channel.

The 'old' channel will be modified to ensure that fish can no longer enter it and become trapped after a flood event.



Any piped waste water discharges will be assessed in terms of waste assimilation capacity of the receiving water and treatment such as oil/water separation will be provided.

### **Mitigation by avoidance**

The timing of the works would be agreed in advance with the NPWS and IFI. The works are located within a river corridor used by salmonids and lampreys for spawning. To protect salmon and trout it will be necessary to time works outside the window of October to May. Brook lampreys spawn in the spring and early summer months and the timing of works should also take this species into account.

Work areas will be limited as far as possible. No in-stream excavations or other works involving interference with the bed, bank or soil should take place outside of the immediate areas where the flood channel joins the Mall River.

No works are proposed for Templemore Lake and this area will be avoided during all construction works.

### **Mitigation by remedy**

The appointed contractor will be required to provide a detailed method statement showing how water quality impacts and habitat loss during the works will be minimised. The methodology will be approved by both the IFI and the NPWS prior to any works taking place.

There will be a requirement for a large-scale fish, lamprey and crayfish translocation operation on the 'old' river channel. It is noted that crayfish cannot be removed by electrical fishing and that lampreys cannot be removed by salmonid type electrical fishing operation. It will be therefore necessary to engage with specialist licensed aquatic Ecologists, in addition, to the IFI. A translocation plan will need to be designed and implemented prior to water being diverted into the new channel.

A suitable Environmental Management System will be used to control sediments during the works; this will include the installation of properly designed silt curtains and a monitoring programme for suspended solids in the river, to be agreed with the NPWS and IFI.

Measures to be used to protect aquatic ecology during construction works will follow the relevant section of the NRA's documents 'Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes' (NRA, 2005). The fisheries board documents "Maintenance and protection of the inland fisheries resource during road construction and improvement works. Requirements of the Southern Regional Fisheries Board" (Kilfeather, 2007) and 'Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites' (Murphy, 2004) would also be followed where relevant.

Water quality impacts during the construction phase would be minimised / avoided by following a method statement agreed in advance with NPWS and the IFI. A silt fence (or equivalent barrier) would be used to surround the works area. This would be installed in the river prior to any works commencing on site. Material removed would be stockpiled within a bunded area / or within a geotextile barrier. All necessary measures would be taken to prevent the release of oil, fuels or other pollutants into the Mall River. The works will be carried out during dry weather and halted during heavy rainfall to reduce suspended solids in the river. Spoil and removed vegetation material from the river is to be stored no less than 5m back from the river and vegetation within this 5m buffer zone is to be retained, in order to reduce the run-off of suspended solids back into the water course.

No exotic invasive flora was recorded from the study site. However, as the machines being used to excavate the river may contain fragments of exotic invasive flora they will need to be cleaned at the start of the excavation of the river.

Disturbed areas will be allowed to re-vegetate naturally. Particular care will be taken when working near mature trees in order to protect roots extending into the works site. Mature trees will be retained and scrub and hedgerow will be retained where possible. The minimum width required for machinery to operate safely will be used so that the least amount of vegetation will be removed.

During the works phase of the project the site will be monitored periodically by an Ecologist to ensure that the measures to protect water quality and aquatic areas are fully implemented by the contractor. The extent of monitoring required will be agreed in advance with the NPWS and the IFI and will be specified in the method statement.

### *7.5.3 Predicted Impacts*

#### **Scenario A (using existing and new flood channel)**

It is clear that this option can be constructed while avoiding significant impacts on aquatic ecology by adhering to the design, construction and operation phase mitigation.

#### **Scenario B (river is diverted into new channel)**

It is clear that this option can be constructed while avoiding significant impacts on aquatic ecology by adhering to the design, construction and operation phase mitigation.

## **7.6 Conclusions**

It is clear that both scenarios can be constructed while avoiding significant impacts on aquatic ecology by adhering the design, construction and operation phase mitigation. However, the preferable scenario is Scenario B (river is diverted into new channel). This scenario would bring permanent significant benefits to aquatic ecology through the creation of a physically and ecologically diverse new channel.

The chosen option is Viable Option 4: Long Diversion and this has been fully assessed as Scenario B above. It will be important to ensure that the proposed weir included in this option is designed to be suitable for passage of brook lampreys and white-clawed crayfish. A suitable solution would be to backfill the downstream end of the weir to create a 'rock ramp'.

## 8 SOILS AND GEOLOGY

### 8.1 Introduction

TOBIN Consulting Engineers have prepared this section of the EIS, which addresses the soil and geology aspects of the environment and assesses the impacts of the proposed scheme on the existing soil, subsoil and bedrock environments.

This Geological Assessment consisted of:

- A desk study of available information;
- A site walkover to visually characterise the site and its geographic and geological setting;
- Drilling investigations within the site; and
- Interpretation of all data and reporting.

Information retained by the Geological Survey of Ireland (GSI) and Environmental Protection Agency (EPA) was accessed to provide the regional geological setting of the site.

The information contained in this chapter has been divided into sub-sections, so as to describe the various aspects pertaining to soil and geology. In the preparation of this chapter, all available regional and site specific information was collated and assessed.

In this chapter the potential impact on the geological environment resulting from development of this site are assessed and mitigation measures are proposed to reduce any significant impacts.

The information available is considered sufficiently detailed to adequately characterise the geological environment of the site and its surrounds.

This section was prepared following a desk study of the channel, floodplain and immediate surrounding areas of the Mall River extending along the main channel upstream and downstream of Templemore. This river has its source in the Devilsbit and Kilduff mountains and through a series of streams and tributaries drains the lands down to Templemore Town. Relevant documents that were accessed comprised geological maps and publications by the EPA, GSI and Teagasc.

#### **Site Visit**

Site investigations comprising a study of the river, its floodplain and the surroundings were undertaken at the subject site in March and December 2009, April 2014 and June 2014.

## 8.2 Study Methodology

This report has been prepared using the recommendations set out in the Environmental Protection Agency's (EPA) document *Guidelines on the Information to be Contained in Environmental Impact Statements* (March 2002). The guidelines and recommendations of the Institute of Geologists of Ireland (IGI) publication *Geology in Environmental Impact Statements – A Guide* (IGI 2002) and *Guidelines for the Preparation of Soils, Geology and Hydrogeology Chapters of Environmental Impact Statements* (IGI 2013) were also taken into account in the preparation of this chapter.

In the preparation of this chapter, relevant information was collated and evaluated. The information sources are detailed further in this chapter.

The following is a list of published geological references and data used:

- Historical Geological 6 inch:1 mile maps;
- Historical OSi 6" and 25" maps;
- An Foras Talúntais (1980). *Soil Map of Ireland*;
- Archer, J.B, Sleeman, A.G., & Smith, D.C. (1996) *A Geological Description of Tipperary and Adjoining Parts of Laois, Kilkenny, Offaly, Clare, and Limerick, to Accompany the Bedrock Geology 1:100,000 scale Map Series, Sheet 18, Tipperary*. Geological Survey of Ireland;
- Cullen, K.T. (1986) *Preliminary hydrogeological report on the Templemore area, Co. Tipperary*. March 1986, K.T. Cullen and Co. Ltd;
- DoELG/EPA/GSI (1999) *Groundwater Protection Schemes*. Department of Environment & Local Government, Environmental Protection Agency & Geological Survey of Ireland;
- Finch, T.F. & Gardiner, M.J. (1993) *Soils of Tipperary North Riding*. Soil Survey Bulletin No. 42, National Soil Survey of Ireland, Teagasc, Dublin;
- Hunter Williams, N. & Wright, G.R. (2001) *An assessment of the quality of public, group scheme and private groundwater supplies in North County Tipperary*. Geological Survey of Ireland;
- M.C. O'Sullivan (1991) *Templemore Water Supply Scheme: Preliminary report for Templemore Urban District Council*. M.C. O'Sullivan Consulting Engineers, Co. Cork;
- M.C. O'Sullivan (1994) *Templemore Regional Water Supply Scheme Stage 1: Volume 5 – Site Investigation Results*. M.C. O'Sullivan Consulting Engineers, Co. Cork; and
- Hunter Williams, N., Motherway, K., Wright, G., (2002) *North County Tipperary Groundwater Protection Scheme* Geological Survey of Ireland.

Site visits of the proposed scheme study area were conducted in March and December 2009 and April and June 2014. Site walkover and site investigation surveys were conducted in the proposed scheme

study area. Fieldwork focused on verifying the accuracy of national datasets. Site specific details were recorded and included logging of subsoil types, vegetation indicators, springs, drainage details and general trafficability of soils. Subsoil deposits and selected exposures/sections were logged according to the British Standard Institute *Code of Practice for Site Investigations* (BS 5930:1999).

All projects and developments that require an EIS are of a scale or nature that they have the potential to have an impact on the environment.

Criteria for evaluating impact levels are shown in Table 8-1 below. Terminology for impact significance and duration follows that set out in the EPA's *Guidelines on the Information to be Contained in Environmental Impact Statements* (March 2002). The magnitude of any effects considers the likely scale of the predicted change to the baseline conditions resulting from the predicted effect and takes into account the duration of the effect, i.e. temporary or permanent. Definitions of the magnitude of any effects are also provided in Table 8-1.

**Table 8-1 Impact Magnitude Definitions<sup>9</sup>**

Magnitude	Criteria
Very High	An impact, which obliterates sensitive characteristics of the soil or geology environment.
High	Fundamental change to ground conditions, groundwater quality or flow regime
Moderate	Measureable change to ground conditions, groundwater quality or flow regime
Low	Minor change to ground conditions, groundwater quality or flow regime
Negligible	No measureable impacts on ground conditions, groundwater quality or flow

Source: EPA's *Guidelines on the Information to be Contained in Environmental Impact Statements* (March 2002)

Impact ratings may have negative, neutral or positive application where:

- Positive impact – A change which improves the quality of the environment;
- Neutral impact – A change which does not affect the quality of the environment; and
- Negative impact – A change which reduces the quality of the environment.

<sup>9</sup>National Roads Authority, 2009

Terms relating to the duration of impacts are as described in the EPA's *Guidelines on the Information to be Contained in Environmental Impact Statements* (March 2002) as:

- Temporary Impact - lasting one year or less;
- Short-term Impact - lasting one to seven years;
- Medium-term Impact - lasting seven to fifteen years;
- Long-term Impact - lasting fifteen to sixty years; and
- Permanent Impact - lasting over sixty years.

A qualitative approach was used in the evaluation, generally following the significance classification in Table 8-2 below and through professional judgement. The significance of a predicted impact is based on a combination of the sensitivity or importance of the attribute and the predicted magnitude of any effect. Effects are identified as beneficial, adverse or negligible, temporary or permanent and their significance as major, moderate, minor or not significant (negligible).

**Table 8-2 Assessment Criteria**

Sensitivity	Magnitude				
	Very High	High	Medium	Low	Negligible
<b>High</b>	Major	Major	Moderate	Moderate	Minor
<b>Medium</b>	Major	Moderate	Moderate	Minor	Negligible
<b>Low</b>	Moderate	Moderate	Minor	Negligible	Negligible
<b>Negligible</b>	Minor	Minor	Negligible	Negligible	Negligible

In order for a potential impact to be realised, three factors must be present. There must be a source or a potential effect; a receptor which can be adversely affected; and, a pathway or connection which allows the source to impact the receptor. Only when all three factors are present can an effect be realised.

### 8.2.1 Legislative and Policy Context

An evaluation of the proposed scheme was carried out in relation to relevant legislation and other statutory policies and guidance. The following legislation was considered as part of this impact evaluation:

- *European Communities (Water Policy) Regulations 2003*[S.I. No. 722 of 2003];
- *Waste Management Acts 1996-2013*;



- *European Communities Environmental Objectives (Groundwater) Regulations 2010* [S.I. No. 9 of 2010];
- Part X of the Planning and Development Act 2000, as amended;
- Part 10 of the Planning and Development Regulations 2001, as amended; and
- Arterial Drainage Act (1945), as amended.

## 8.3 Existing Environment

### 8.3.1 Topography

The river catchment varies dramatically from 400mOD on the Devilsbit Mountain to 100mOD within the river valley and around Templemore Town. The study area and proposed scheme varies in elevation from 115mOD to 100mOD. The topographic nature of the surrounding lands is generally of low - moderate relief and gently undulating.

### 8.3.2 Soil

Reference to the EPA Data, indicates that the principal soil type along the Mall River is comprised of poorly drained surface water gleys, groundwater gleys and peaty gleys. Within the upper catchment and on elevated lands, the soils are comprised of well drained Grey/Brown Podzolics or Brown Earths. Mineral alluvial soils form the banks of the Mall River including areas within Templemore Town.

Within and immediately adjacent to the Mall River, alluvial deposits and poorly drained mineral soils with peaty topsoil dominate. Made ground underlies the developed areas within Templemore Town.

### 8.3.3 Sub-Soil / Quaternary Geology

Figure 8.1 overleaf provides an extract from the GSI Subsoil mapping, illustrating the mapped subsoils in the area.

The subsoil map ([www.epa.ie](http://www.epa.ie)) for the Mall catchment area, shows that the area under investigation is underlain by till derived chiefly from limestone with a significant area of made ground around Templemore Town centre. The till material is comprised of a deep limestone till. Based on site investigation works, this material is generally soft to firm, light brown, gravelly CLAY/SILT.

Alluvium deposits are located along the former flood plain of the Mall River and particularly evident upstream from Templemore and through the town centre itself. The lake at Templemore is surrounded on three sides by alluvial deposits. The alluvial deposits vary in width from 0.5 m to 2m. Based on the GSI data and site investigation works for the *Templemore Regional Water Supply Scheme (MCOS, 1994)* the depth to bedrock in the Mall River catchment area varies from <1 metre to 2 metres along the route of the scheme.

#### Proposed Embankment to Patrick Street – Chainage 2500-2700

Soil is comprised of peaty podzols overlying soft, light brown/grey sandy SILT and soft organic clays. The soil is moderately to highly plastic. Bedrock is present underlying the soils at 1 to 1.5m below ground level (bgl). Made ground is approximately 1m deep to the north of Patrick Street (Chainage 2500-2600, refer for Figures 2-1 and 2-2).

#### Patrick Street to Talavera – Chainage 2200-2500

To the south of Patrick Street made ground overlies very soft to moderately firm, very sandy SILT with soft organic CLAY and occasional peat horizons. Till deposits are encountered on higher elevations, to the north of Talavera Road. Occasional sandstone and limestone clasts were present. The till subsoil along the section is comprised of moderately firm to firm, mid brown, very sandy, gravelly CLAY/SILT. Bedrock is present underlying the soils at 1 to 1.8m bgl.

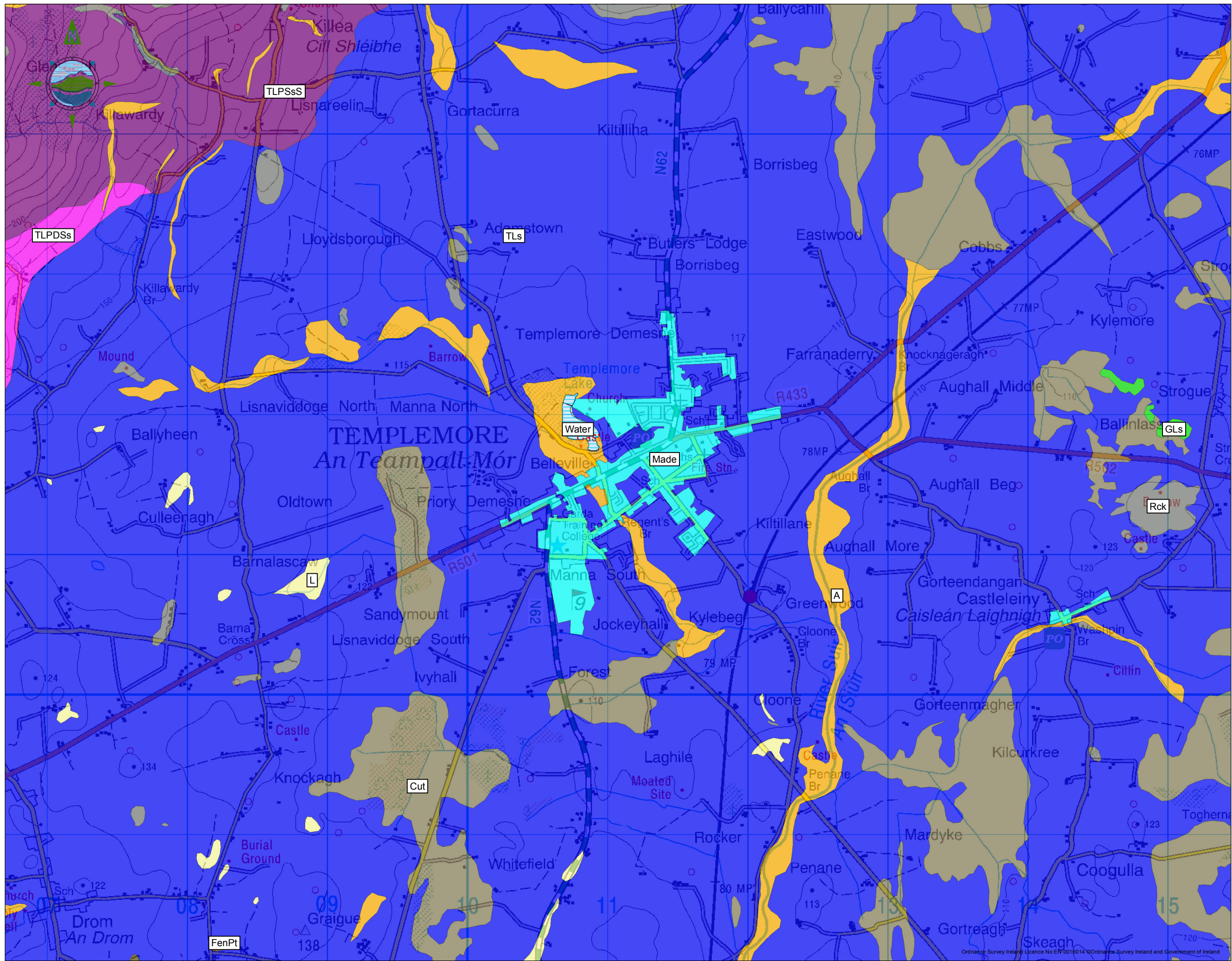
#### Talavera to River Mall – Chainage 2000-2200

Till derived from Limestone deposits is located to the south of Talavera. Occasional sandstone clasts and limestone were present. The subsoil along the section is comprised of moderately firm to firm, mid brown, very sandy, gravelly CLAY/SILT. Alluvial deposits are present adjacent to the Mall River.

#### Mall River

Alluvial deposits are present adjacent to the Mall River from the start of the proposed diversion scheme to the confluence with the River Suir and its tributaries.





### Legend

- Alluvium undifferentiated
- Water
- Fen Peat
- Cutover Peat
- Limestone Sands and gravels (Carboniferous)
- Bedrock at surface
- Lake sediments undifferentiated
- Sandstone till (Lower Palaeozoic/Devonian)
- Sandstone and shale till (Lower Palaeozoic)
- Limestone till (Carboniferous)
- Made ground

0 0.1 0.2 0.4 0.6 0.8  
Kilometres

**NOTES**

1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Issue	Date	Description	By	Chkd.
A	16.07.14	Issued	G.F.	A.A.

Client:

Project:

TEMPLEMORE  
FLOOD RELIEF SCHEME  
EIS

Title:

SUBSOILS MAP

Scale @ A3: 1:25,000

Prepared by: G.Fil      Checked: A. Austin      Date: July 2014

Project Director: D.Grehan

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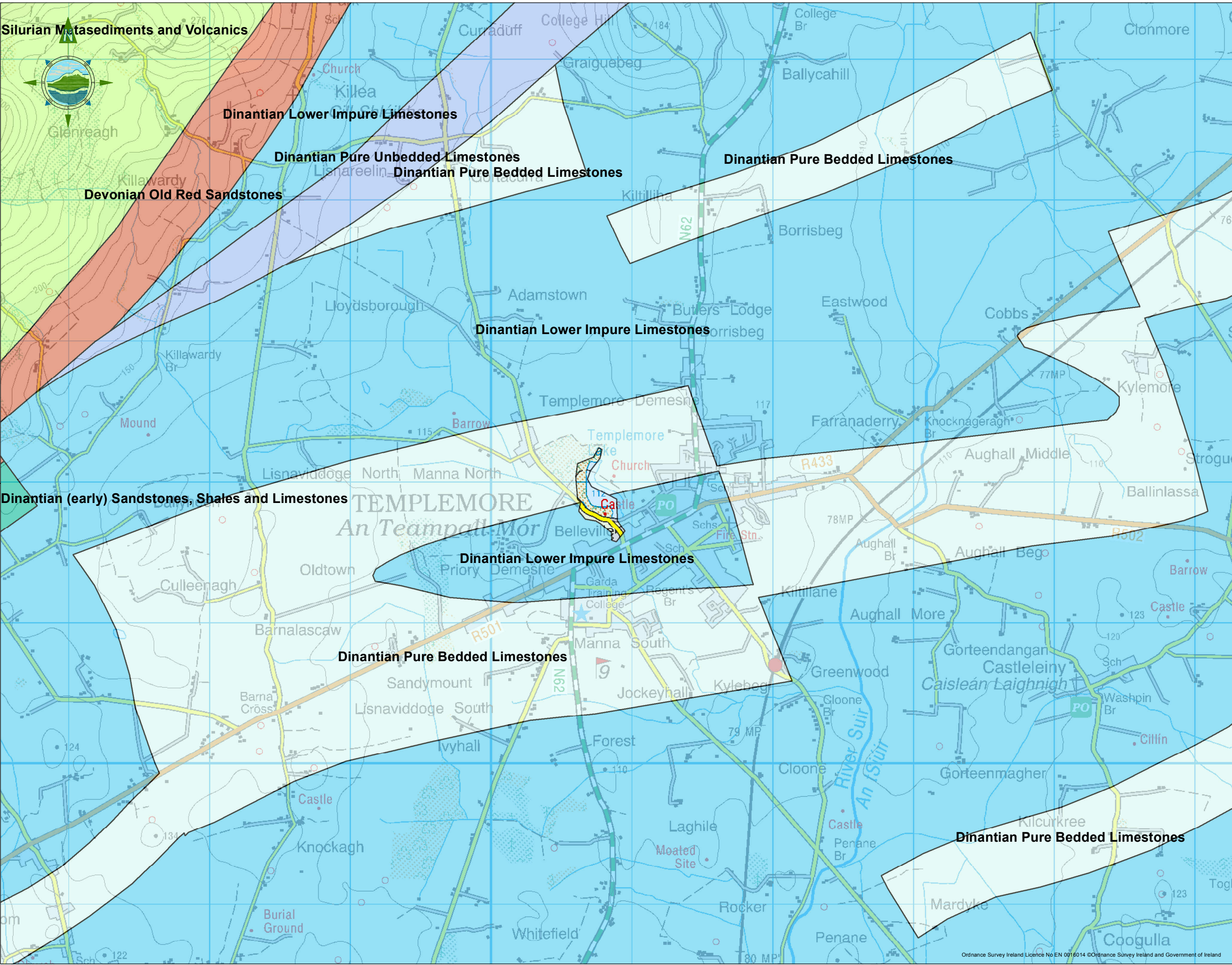
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Figure 8.1

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### Legend

- Devonian Old Red Sandstones
- Dinantian (early) Sandstones, Shales and Limestones
- Dinantian Lower Impure Limestones
- Dinantian Pure Bedded Limestones
- Dinantian Pure Unbedded Limestones
- Silurian Metasediments and Volcanics

0 0.1 0.2 0.4 0.6 0.8  
Kilometres

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Issue	Date	Description	By	Chkd.
A	16.07.14	Issued	G.F.	A.A.

Client:

**OPW**  
The Office of Public Works  
Oifís na hArdchúsa Poblaithe

Project:

**TEMPLEMORE  
FLOOD RELIEF SCHEME  
EIS**

Title:

**BEDROCK GEOLOGY  
MAP**

Scale @ A3: 1:25,000

Prepared by:	Checked:	Date:
G.Fil	A. Austin	July 2014

Project Director: D.Grehan

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Figure 8.2

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#### 8.3.4 Bedrock Geology

The distribution of geological units, within and surrounding the site, based on published information from the GSI is shown in Figure 8.2 overleaf. The composition and the characteristics of the various rock units are discussed below.

Reference to the relevant geological information, the 1:100,000 scale Sheet No. 18 – *Bedrock Geological Map of Tipperary*. Geological Survey of Ireland (GSI), (1994) indicates that the site and surrounding area is underlain by Ballysteen Formation (BA) and the overlying Lisduff Oolitic member (BA Id). Further to the north and west, within the upper catchment and Devilsbit Mountains Devonian age sandstones and shales are present.

##### **Ballysteen Formation**

This formation was deposited during a period of increasing water depth during the Dinantian age which resulted in the deposition of fossiliferous muddy limestone. The Ballysteen Formation becomes increasingly muddy towards the upper part of the formation. The upper Ballysteen is mapped as underlying part of the flood relief scheme.

This formation is characterised by blue-grey to mid grey argillaceous (muddy) limestones. These are interbedded with thin styolitic shales or calcareous shales. The shales and limestones are fossiliferous. Karstic features are encountered within the lower Ballysteen formation. Some karst features have been identified within the Ballysteen Formation approximately 3km to the north of Templemore at Kiltilliha. These are located outside the site study area. No known karst features exist within the study area.

##### **Lisduff member**

Typically these rocks comprise thick bedded, pale blue-grey, cross-bedded, well-jointed oolite of variable thickness. The Lisduff Oolite is located on either side a gentle east west trending anticline. Thickness of the Lisduff member range are up to 100m thick however given the mapped geology thickness in the area are expected to be thin.

Faulting in the Templemore catchment area shows a pattern of north northeast to west southwest faults with a north northwest – south southeast fault present 1km to the east of Templemore. There is a mapped fault identified on GSI Sheet No. 18, approximately 1km to the east of the proposed scheme.

##### **Aquifer Classification**

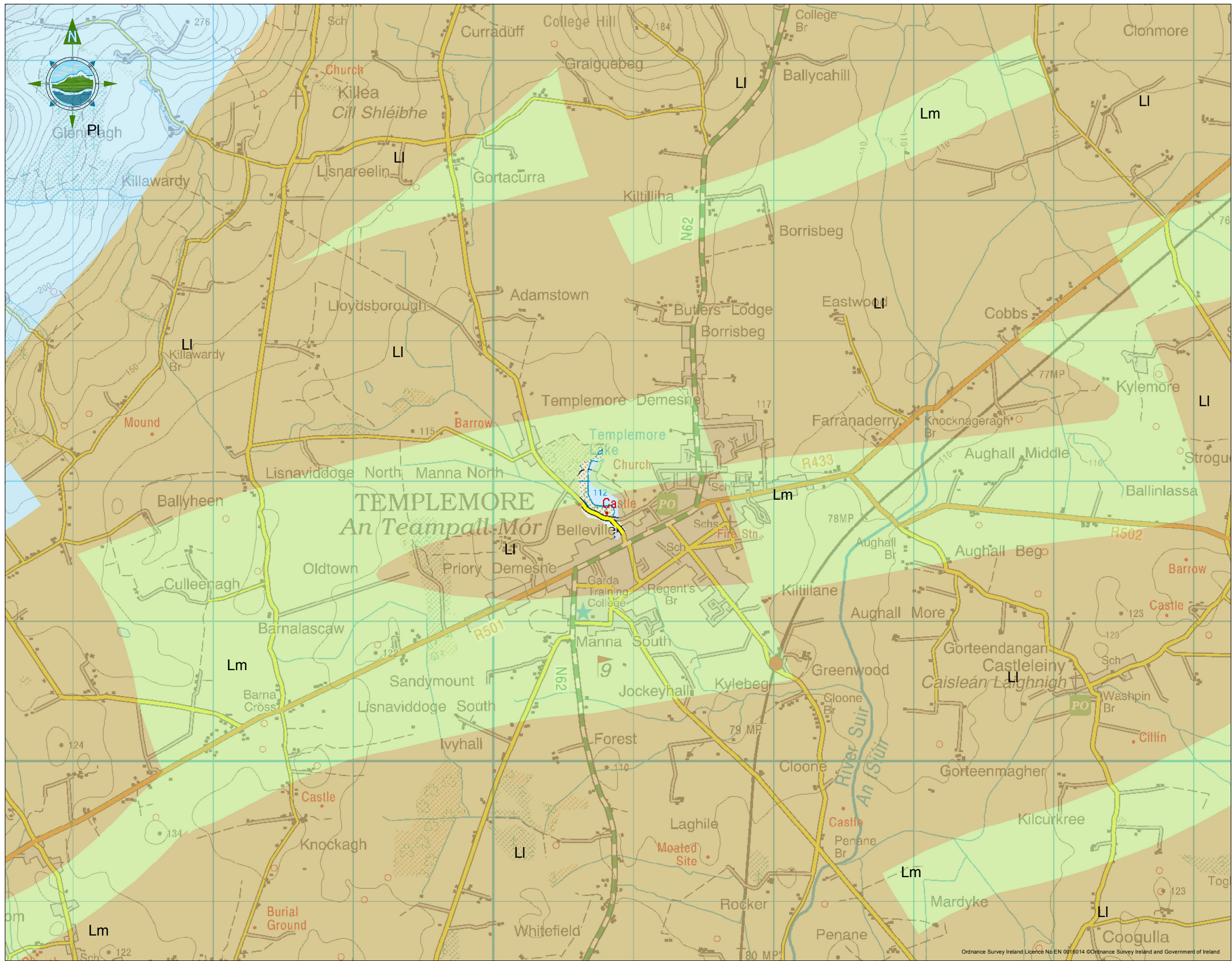
Reference to the National Aquifer Map (refer to Figure 8-3 overleaf), prepared by the Geological Survey of Ireland, the Ballysteen Formation and Lisduff member are classified as locally important Aquifers. The Lisduff member is classified a Locally Important Aquifer, which is moderately productive (Lm). The Ballysteen Formation, Cadamstown Formation and the Waulsortian is classified as a Locally important

Aquifer, which is moderately productive in localised zones (LI). Bedrock Permeability varies throughout the formation although estimate bulk values of permeability are taken as 10 m/d at Templemore. The permeability in the aquifer depends on the development of faults, fissures and fractures, as indicated by pumping tests and site investigations, in addition to regional experience.

Minor aquifers, LI (Locally Important Aquifers, productive in local zones) are predominant in the Templemore area. These aquifers include the Cadamstown (Devonian) and Ballysteen Formations and the Waulsortian limestones (Carboniferous). The Devonian Sandstones to the north are classified as Poor Aquifers which are generally unproductive except in local zones (PI).

No major springs were encountered during the field surveying along the Mall River. Falling head tests were conducted in the upper bedrock/transition zone with moderate permeability values in the region of  $1.55 \times 10^{-5}$  to  $1.55 \times 10^{-6}$  m<sup>2</sup>/second. Specific capacity and permeability is likely to be increase in areas of increased folding/faulting. No faults were identified within 1km of the proposed scheme.





## Legend

- LI** Locally Important Aquifer - Bedrock which is Moderately Productive only in Local Zones
- Lm** Locally Important Aquifer - Bedrock which is Generally Moderately Productive
- PI** Poor Aquifer - Bedrock which is Generally Unproductive except for Local Zones

0 0.1 0.2 0.4 0.6 0.8  
Kilometres

### NOTES

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Client:



Project:

TEMPLEMORE  
FLOOD RELIEF SCHEME  
EIS

Title:

AQUIFER CLASSIFICATION  
MAP

Scale @ A3: 1:25,000

Prepared by: G.Fil Checked: A. Austin Date: July 2014

Project Director: D.Grehan



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Figure 8.3

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### **Water Usage**

Water usage within the proposed scheme study area is primarily supplied by Tipperary County Council from their groundwater water abstractions at the College Hill public water supply, approximately 3km north of the town. There are no public water supplies within approximately 1km of the proposed scheme. Based on a review of the 2011 census data there are no private wells along the proposed scheme. A search of the GSI well database shows there are site investigations in the area with the vast majority drilled as part of the site investigation works for Templemore Town wastewater supply scheme. The GSI Well Database is a record of reported wells drilled in Ireland. Trial pits logs are included in Volume 3, Appendix 8.1. While much useful information can be obtained from this Index, it is important to note that it is by no means exhaustive, as it requires individual drillers to submit details of wells in each area. Templemore is supplied by College Hill public water supply approximately 3km to the north of town. The College Hill boreholes supplies approximately 2,600m<sup>3</sup>/day to the town and surrounding areas.

### **Groundwater Vulnerability**

The Department of Environment Heritage and Local Government (DoEHLG), EPA and GSI have produced guidelines on groundwater vulnerability mapping that aim to represent the intrinsic geological and hydrogeological characteristics that determine how easily groundwater may be contaminated by human activities. Vulnerability depends on the quantity of contaminants that can reach the groundwater, the time taken by water to infiltrate to the water table and the attenuating capacity of the geological deposits through which the water travels.

The DoEHLG, EPA and GSI vulnerability mapping guidelines allow for the assignment of vulnerability ratings from 'extreme' to 'low', depending upon the subsoil type and thickness. With regard to sites where low permeability subsoils are present, the following thicknesses of unsaturated zone are specified in Table 8-3 overleaf.



**Table 8-3 Groundwater Vulnerability Categories**

Vulnerability Rating <sup>10</sup>	Hydrogeological Conditions				
	Subsoil Permeability (Type) and Thickness			Unsaturated Zone	Karst Feature
	High Permeability (Sand and Gravel)	Medium Permeability (Sandy Subsoil)	Low Permeability (Clayey Subsoil/Peat)	Sand and Gravel aquifers only	<30 radius
<b>Extreme</b>	0 – 3.0m	0 – 3.0m	0 – 3.0m	0 – 3.0m	-
<b>High</b>	>3.0m	3.0 -10.0m	3.0 – 5.0m	> 3.0m	N/A
<b>Moderate</b>	N/A	>10.0m	5.0-10.0m	N/A	N/A
<b>Low</b>	N/A	N/A	>10m	N/A	N/A

Notes: N/A Not Applicable; Precise Permeability values cannot be given at present; Release point of contamination is assumed to be 1-2m below ground surface.

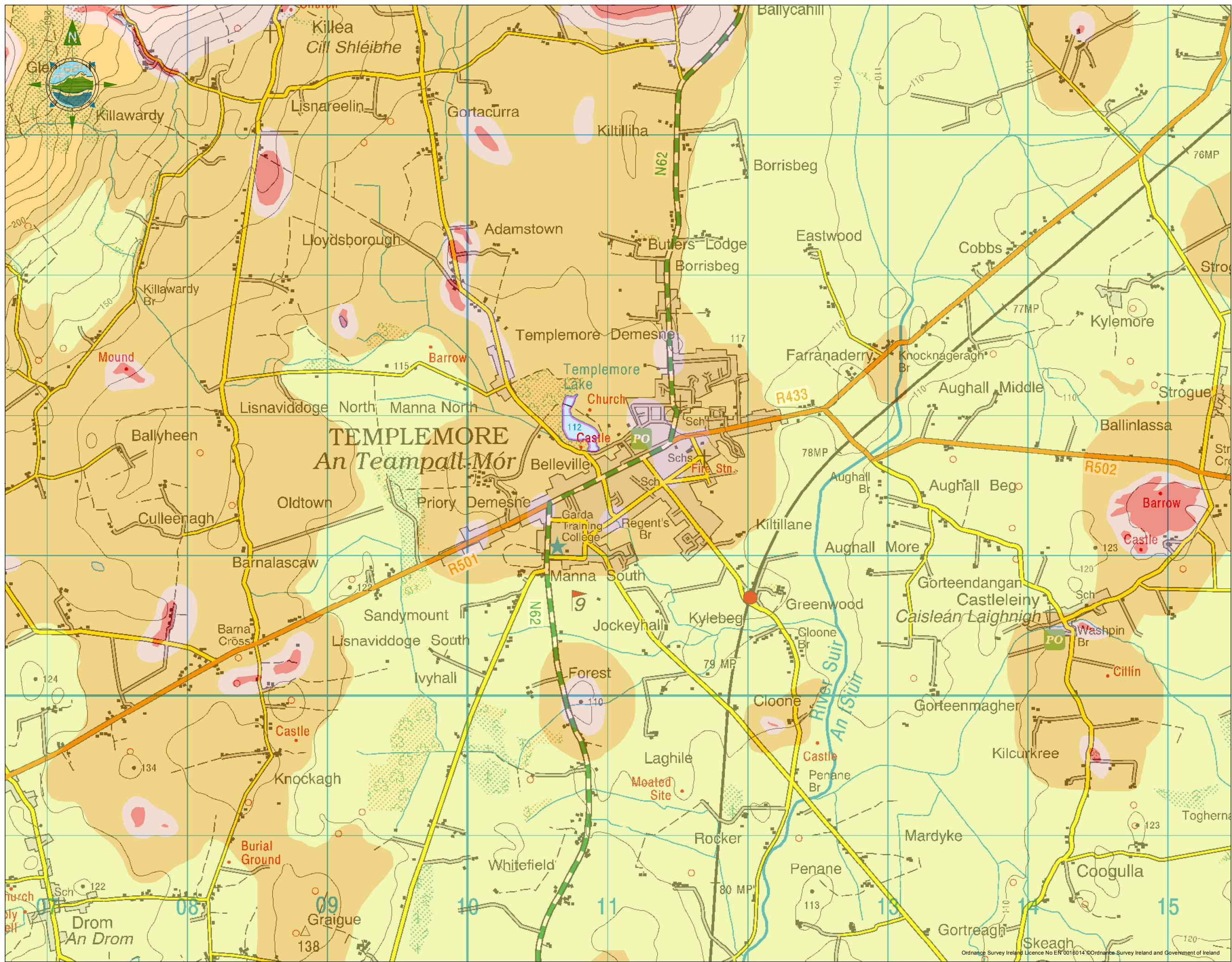
The principal vulnerability classes are extreme to high along the proposed scheme. Refer to Figure 8.4 overleaf.

### 8.3.5 Areas of Geological Heritage Importance

The GSI provides scientific appraisal and interpretative advice on geological and geomorphological sites, and is responsible for the identification of important sites that are capable of being conserved as Natural Heritage Area (NHA). The National Parks and Wildlife service (NPWS) of the Department of Arts, Heritage and the Gaeltacht (DAHG) has the responsibility of designation and management of sites, with appropriate advice from GSI. At present, the GSI have not compiled a list of sites proposed for designation as Natural Heritage Areas (pNHAs) for Tipperary. The GSI was consulted as part of the process with regard to areas that may have geological or geomorphological importance. There are no sites of geological interest within the development boundary.

<sup>10</sup> Based on GSI Classification system





## Legend

- E Extreme
- H High
- L Low
- M Moderate
- E Rock near / at surface or karst

0 0.1 0.2 0.4 0.6 0.8  
Kilometres

- NOTES**
1. FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
  2. ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
  3. ENGINEER TO BE INFORMED OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
  4. ALL LEVELS RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Issue	Date	Description	By	Chkd.
A	16.07.14	Issued	G.F.	A.A.

Client:  


Project:  
**TEMPLEMORE  
FLOOD RELIEF SCHEME  
EIS**

Title:  
**VULNERABILITY MAP**

Scale @ A3: 1:25,000

Prepared by: G.Fil  
Checked: A. Austin  
Date: July 2014

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Figure 8.4

A



### 8.3.6 Contaminated Land

An evaluation was undertaken to determine the presence and extent of potentially contaminated land in the proposed development. This evaluation is based on the identification of potential sources pathways and receptors along the proposed scheme route. If all three elements (source, pathway and receptor) are present, there is a contaminant linkage and there is a potential for the contamination to represent a risk to the receptor(s) and for the site to be considered as contaminated.

Two sites were identified as having a potential for land contamination in the immediate area of the proposed scheme alignment. The sites are a garage and infill area to the north of Patrick Street and an infill area to south of Patrick Street. Contaminants associated with garage typically include petrol, diesel and heavier hydrocarbons. The area was screened using a Minirae Photo Ionising Detector (PID) and soils were examined using a soil auger. This PID is a *screening* procedure for estimating the total concentration of volatile organic compounds (VOCs) in soil samples. Samples were taken from the area surrounding the garage and to the south of Richmond Road. No evidence of hydrocarbon odour or discolouration was noted during the sampling and all samples were within normal background concentrations. A slight organic smell was noted on some soil samples however this is consistent with natural subsoils comprised of organic silts and clays. The infill material to the south of Patrick Street is comprised primarily of stone and soil infill with some minor component of concrete and brick. No evidence of contamination was noted. In addition to specific sites, it should be noted that there is a general potential for pollution from entrained agricultural chemicals on present and past agricultural land, and from buried material which may occur almost anywhere along the proposed scheme.

### 8.3.7 Development Characteristics

The Office of Public Works (OPW) has designed for a Flood Relief Scheme for Templemore in accordance with the Arterial Drainage Act (1945) and the Arterial Drainage (Amendment) Act (1995).

In summary, the proposed scheme will comprise of:

- Embankments upstream of the town, together with a ramp on Blackcastle Road, to prevent water flooding across the fields and down the Blackcastle Road into the town;
- A diversion channel to take the river from the embankments upstream of the town, through the town, to downstream of Small's Bridge;
- Walls and embankments upstream of Small's Bridge to protect properties;
- An embankment adjacent to Railway View Estate;
- Channel widening and regrading works within the Mall River south of Templemore Town; and
- Maintenance of channel and flood relief works.

## 8.4 Potential Impacts

Two flood relief scheme scenarios were considered in this assessment:

- A. The river will be left in its current channel route, with the new channel taking only flood flows; and
- B. The river is diverted in full to the new channel.

It should be noted that the potential impacts are similar in both scenarios and they are therefore assessed together below.

During construction of the proposed scheme, the impact on the geological environment will be low. Implementation of the proposed scheme will result in the removal of made ground and soils from parts of the subject site to facilitate the construction of the diversion channel and other components proposed. This is a direct, permanent impact but is not considered to be a significant negative impact. The proposed scheme will have no impact on the surrounding geological environment; therefore there will be no short to long-term impacts outside the site boundary.

### 8.4.1 Construction

The significance of potential impacts associated with contaminated land has been evaluated broadly based on guidelines in *Contaminated Land Risk Assessment, A Guide to Good Practice* (CIRIA, 2011). Potentially contaminated land has been identified along the proposed scheme. However, no significant contamination risk was identified along the proposed route. The potentially contaminated land sites identified along the route of the proposed scheme do not pose a significant constraint to the development. If contamination is unexpectedly encountered mitigation measures are incorporated below into Section 8.5. Removal or remediation of any contaminated soils if encountered along the route of the proposed scheme would be a minor beneficial impact. Excavation depths will vary from 2m to 4m in depth to the invert level of the foundation and anywhere from 8m to 20m wide. The total excavation will be approximately 20,723m<sup>3</sup> for the length of the scheme (includes 60m of inlet). This represents an average 25.66m<sup>3</sup> per meter of the excavation.

It is considered that the construction works only would have minor effects on the geomorphology of the area as the channel construction would not materially change the local topography.

It is considered that the vast majority of this material will consist of sub-soil and naturally excavated alluvial soils, till deposits and bedrock. The surplus excavated material from channel excavations of approximately 16,000m<sup>3</sup> with 10,000m<sup>3</sup> proposed to be reused insitu. As it is anticipated that >95% of the excavated materials would comprise natural uncontaminated soils, there would be no contamination restrictions on the ability of landfills to accept the materials. Made ground material will be taken off-site



and deposited at an appropriately licensed/permitted waste management site. Mitigation measures will be in place should contamination be encountered as outlined in Section 8.5.

The ground conditions in the vicinity of the proposed scheme are considered to be of low sensitivity with no Groundwater Dependent Terrestrial Ecosystem (GWDTE) in close proximity of the scheme. Impacts on the existing ground conditions would be restricted to the excavation locations. The magnitude of the impacts of the diversion is considered low.

Potential impacts may arise where construction works cross areas of alluvial soils. Access tracks will comprise of aluminium tracks, rubber matting or timber sleepers. Mitigation measures are detailed in Section 8.5.

Potential short term impacts during the construction phase include activities associated with the movement, excavation and disposal of soils, contaminated materials (if present) and bedrock, compaction of soils and temporary construction of temporary access routes.

During the construction phase, the digging of the channel may lead to an increase in soil erosion. During the construction phase management of topsoil, subsoil removal and rock excavation will be required. Topsoil removal has the potential for silt and clay to be removed by rainfall and surface water runoff. Siltation of nearby watercourses, namely the Mall River, may be a potential impact and careful removal and storage of subsoil should be considered. Any topsoil that is removed will be used for regarding at a later stage.

During the construction phase, machinery on site will include diesel powered trucks and excavators. The potential impacts to the underlying soil and geology from the proposed scheme could derive from accidental spillages of fuels, oils and solvents, which could impact the soil, bedrock and groundwater quality, if allowed to infiltrate to ground during construction.

The evaluation of the significance of potential impacts on groundwater also is based on the source-pathway-receptor approach and is determined from a combination of the sensitivity of the receptor and the magnitude of any impact. Groundwater receptors include poorly productive aquifers. The channel is not located within the source protection zone of public groundwater supply schemes.

The proposed scheme has the potential to impact locally on groundwater flow by a minor increase in low flows in the river due to the lowering of ground level in the area. The deeper channel may have a minor beneficial impact on the low flows volumes in the Mall River / Diversion.

The channel excavations will vary between approximately 2m and 4m depth. Groundwater may be encountered in excavations as groundwater levels vary between 0.5m and 3m below ground level (bgl). If excavations for channel bases encounter groundwater, such inflows may need to be pumped, resulting in short term localised drawdown of the water table and discharges to the surface water channels. Due to the limited drawdown and pumping required, it is considered that any significant impacts on the groundwater level will be realised only in close proximity to the proposed channel.

Water pumped from the excavations may contain suspended solids and contaminants. In the absence of any treatment, the disposal of this water to ground or to the surface water system could cause deterioration in water quality of the receiving system. Mitigation measures are outlined in Section 8.5 overleaf.

### Constructed Embankments

It is proposed to construct approximately 727m of embankments to prevent water flooding residential dwellings. A total of approximately 5,053m<sup>3</sup> of material will be required for this purpose.

It is currently proposed that the excavated natural subsoil material, where possible, will be reused as fill material for flood embankment purposes. The overall impact of backfilling and landscaping of indigenous subsoil (in accordance with general engineering practice) on completion of the proposed scheme is expected to be imperceptible.

It is envisaged that the proposed scheme will take place in a phased manner, thus reducing the area of the site that will be stripped at any one time. The diversion of flows along the new channel will have a moderate/high beneficial impact along the existing river course where buildings and roads are currently being eroded and undermined by flood flows.

Provided the mitigation measures described below are implemented, it can be concluded therefore that the construction of the proposed scheme will have no significant negative impact on the soil or geological environment.

### *8.4.2 Operation*

Due to the nature of the development, the proposed scheme will have a neutral residual impact on the soils and geology environment.

Potential impacts include erosion of the embankment by inappropriate landuse. Potential impacts which may affect the function of the embankment include erosion by animals, borrowing animals, trees and settlement. Key to this is the geotechnical design and a long term management plan. Mitigation measures are detailed in Section 8.5.

## 8.5 Mitigation Measures

### 8.5.1 Construction

These mitigation measures are designed to address the temporary impacts associated with the construction phase of the proposed flood relief scheme. Works will be undertaken in accordance with CIRIA 650 'Environmental good practice on site'.

Planned construction works will be carried out with the minimum disturbance of soils. It is envisaged that topsoil would be retained on site where possible as fill material and for landscaping purposes. The use of excavated materials in this manner ensures that the potential environmental impact of the development is minimised, as the requirement to import significant amounts of materials from outside the site will be minimised, as will the requirement to transport material off the site.

To minimise any impact on the underlying subsurface strata from material spillages, all oils, solvents and paints used during construction will be stored within specially constructed dedicated temporary bunded areas.

Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area, away from surface water gullies or drains. Spill kits and hydrocarbon adsorbent packs will be stored in this area and operators will be fully trained in the use of this equipment.

The combined application of these measures will ensure that inputs to, and subsequent contamination of, the soil environment do not occur during normal and/or emergency conditions.

Settlement of runoff and groundwater from the construction site will be required as part of the site works. Works will be undertaken in accordance with CIRIA 650 'Environmental good practice on site'. Where excavation are undertaken <5m from existing structures, the design may require an number of measures to provide stability of the excavations including sheet piling and auger piling adjacent to existing structures. A detailed condition survey should be conducted on properties within 5m of the diversion prior to and post construction.

### 8.5.2 Operation

Due to the nature of the development, the proposed scheme will have a neutral residual impact on the soils and geology environment. It is essential that the embankment is designed to withstand the anticipate pressures during the lifetime of the project. This will require maintenance checks on the embankments to ensure good performance over the lifetime of the project. The maintenance of the

embankment should follow the framework and principles set out in 'Management of Flood Embankments, A good practice review' (DEFRA/EA, 2007).

## 8.6 Conclusions

In terms of Soils and Geology, the potential construction impacts for developing the flood relief scheme are the same for both scenarios as mentioned above. The implementation of mitigation measures will be required to ensure that the river is not impacted during the construction and operational works. No residual impacts to the soil and geology environments are foreseen during the operational phase of the proposed flood relief scheme.

## 9 WATER

### 9.1 Introduction

TOBIN Consulting Engineers have prepared this section of the EIS, which assesses the impact of the proposed Templemore Flood Relief Scheme on the water environment during the construction and operational phases and addresses and mitigates any possible sources of pollution from each phase.

### 9.2 Study Methodology

This report has been prepared using the recommendations set out in the Environmental Protection Agency (EPA) document 'Guidelines on Information to be contained in Environmental Impact Statements' (2002).

This section describes the hydrological setting of the site and refers to the information available from a number of published sources.

The information contained in this section has been divided into sub-sections, so as to describe the various aspects pertaining to water environment. In the preparation of this section the following protocols were used in order to assess the hydrological context and character of the site:

- The site was assessed using published information and regional hydrological data;
- All available information was collected from the EPA with respect to historical water quality in this region;
- All available information from the Geological Survey of Ireland (GSI) was assessed and collated;
- All available flow monitoring and details of flooding events was obtained from the OPW to gather site specific information on surface water conditions; and
- This Water Report (Surface Water and Groundwater) was prepared following the interrogation and collation of all available information.

The characterisation of the site is considered detailed and sufficient to adequately characterise the hydrological and hydrogeological setting of the site.

All projects and developments that require an EIS are of a scale or nature that they have the potential to have an impact on the environment. It is therefore crucial that the significance of the potential impact is determined. In this section the potential impact on the surface water environment resulting from the construction of the flood relief scheme at the proposed location is assessed and appropriate mitigation measures are submitted.

### 9.3 Existing Environment

For the purposes of this project TOBIN Consulting Engineers are required to assess the environmental impacts of the proposed flood relief scheme and prepare an Environmental Impact Statement (EIS) in respect of the proposed scheme. This section addresses the surface water and groundwater aspects of the environment and assesses the impacts of the proposed scheme on the existing surface water and groundwater environments.

#### 9.3.1 Surface Water Drainage

The study area is situated within the catchment area of the Mall River. The principal area is the channel, floodplain and immediate surrounding areas of the Mall River extending along the main channel upstream and downstream of Templemore Town. The river is fed from groundwater baseflow and surface water run-off from within its catchment. The source of the Mall River is in the Devilsbit and Kilduff Mountain ranges located approximately 6km to the northwest of the subject site. The river emerges from the mountain ranges and flows in a south easterly direction. At Lisnaviddoge North, the river changes direction and flows in an east-north-east direction. A small tributary, which has its origins in the townlands of Lloydsborough and Adamstown, flows into the Mall River in the area where it turns to flow to the southeast. Apart from a series of tributaries at its source, this small tributary is the primary contributor to the Mall River along its course.

The Mall River is joined by two tributaries entering the right bank at Kylebeg approximately 1.2km downstream of Templemore Town. The Mall River crosses the railway line 100m downstream of the confluence at Kylebeg and under Cloone Bridge after another 100m.

The Mall River is a tributary of the River Suir. The Mall River joins the River Suir 300m downstream of Cloone Bridge at Greenwood. The confluence of the Mall River and River Suir is located approximately 2.5km to the southeast of Templemore Town. The River Suir rises in northern County Tipperary and flows south and east. It is joined by the Barrow and the Nore before entering Waterford Harbour approximately 114 miles (183 km) later.

Within the specified study area there is one large surface water feature of note. There is an artificial lake to the north of Templemore Town that has been developed as part of Templemore Park. Inflows into this lake and outflows (to the Mall River) are controlled by manually operated sluices.

The proposed scheme will require the diversion of a number of services including foul and storm water diversions. At present, a 600mm Combined Sewer Outfall (CSO) discharges to the Mall River adjacent to Smalls Bridge. While the frequency of discharge to the Mall River is unknown, it is understood to discharge storm flow from buildings, roads and hardstand areas to the west of Templemore Town. As no upgrade works are planned for the CSO, it is proposed to connect the CSO to the new full or partial



diversion channel. The impact of the full diversion would have a negligible/neutral potential impact on the Mall River. A partial diversion would have a minor negative potential impact on the scheme in comparison to the existing situation. This is principally due to the potential discharge of the CSO to an empty channel. CSOs typically coincide with periods of high river flows which would mitigate the potential impact however the discharge characteristics are not known for the CSO.

### 9.3.2 Hydrometrics Data

According to the EPA (Environmental Protection Agency), no EPA hydrometric data has been recorded for the Templemore area as no EPA gauges have been established in this region. One river gauge is currently in operation by the OPW at Small's Bridge – Station 16136. This uses the continuous record of water levels from the four calendar years 2010 to 2013, inclusive. From this data a flow duration curve was calculated for the Mall River. This estimates that half of the time  $0.186 \text{ m}^3/\text{s}$  was exceeded, 67% of it had flows greater than  $0.085 \text{ m}^3/\text{s}$  (i.e. one third of an average year can expect to have a flow less than this) and also that 75% of the time flows were bigger than  $0.058 \text{ m}^3/\text{s}$ , i.e. for a total of 12 months in this four year period flows were smaller. However, focusing on flow rates shows, for example, that  $0.5 \text{ m}^3/\text{s}$  is exceeded 27.3% of the time, and  $0.25 \text{ m}^3/\text{s}$  for just over 43%. Clearly, the 95%ile flow must be smaller than these; (to three significant places) it is just  $0.004 \text{ m}^3/\text{s}$ . The low flow data and specifically using Q50/ Q90 ratio indicates very limited baseflow during dry periods. Potential causes of limited low flow in the Mall River include a higher groundwater throughflow component and surface water / groundwater abstractions in the upper catchment. At present, there are large public water supply abstractions in the upper catchment.

Relatively recent flooding is reported and documented for the Mall River. Floodwaters frequently exceed the riverbank height along the river course upstream of Templemore. Flooding of roads normally occurs about once a year. Flooding of properties has occurred three times in the last 15 years, with the November 2000 flood event being the most severe, resulting in 39 properties being flooded. The December 1968 flood produced the worst flooding in living memory causing water levels about 0.5m higher than those experienced during the November 2000 flood event in the George's Street area. The extent of flooding and flooding mechanisms are discussed in more detail in the OPW Engineer's Report which is available from OPW.

### 9.3.3 Surface Water Quality

An assessment of the aquatic habitat was carried out along the proposed scheme at Templemore. See Chapter 7 *Aquatic Ecology* for further details. Detailed below is the available EPA monitoring data downstream of the proposed scheme.

The EPA monitors the quality of Ireland's surface waters and assesses the quality of watercourses in terms of four quality classes; 'unpolluted' (Class A), 'slightly polluted' (Class B), 'moderately polluted'

(Class C), and 'seriously polluted' (Class D). These water quality classes and the water quality monitoring programme are described in the EPA publication 'Water Quality in Ireland, 2003'.

The water quality assessments are largely based on biological surveys. Biological Quality Ratings or Biotic Indices (Q values) ranging from Q1 to Q5 are defined as part of the biological river quality classification system. The relationship of these indices to the water quality classes defined above, are set out in Table 9-1 below.

**Table 9-1 Relationship between Biotic Indices and Water Quality Classes**

Biotic Index	Quality Status	Quality Class
Q5, 4-5, 4	Unpolluted	Class A
Q3-4	Slightly Polluted	Class B
Q3, 2-3	Moderately Polluted	Class C
Q2, 1-2, 1	Seriously Polluted	Class D

No water quality monitoring stations are located on the Mall River according to the EPA Water Quality Map and the EPA River Water Quality Report, 2002. However, near the point of confluence between the Mall River and the River Suir, there are two monitoring stations. This area of confluence is within the study area.

The EPA Water Quality Database indicates that the water quality in the River Suir varies from Unpolluted to Moderately Polluted, based on the biotic index of the water assessed at both monitoring points from 1986 - 2003. The most recent and historical biotic indices at each of the quality monitoring stations situated near the point of confluence are presented in Table 9-2.

**Table 9-2 Recent and historical biotic indices for the River Suir**

Station No.	Location	1999	2000	2002	2005	2008	2011
0100	Knockanroe Br River Suir, Up gradient of Templemore Town	4	4	3-4	4	4	4
0200	Knocknageragh Br River Suir, Up gradient of Templemore Town	3-4	3-4	4	3-4	3-4	3-4
0300	Penane Br River Suir, Down gradient of Templemore Town	3	3	3	3	3	3-4

Based on EPA monitoring data ([www.epa.ie](http://www.epa.ie)), the 2011 biotic indices indicate that there is moderate pollution in the River Suir close to where the Mall tributary meets the main river. Possible sources of pollution include sewage from Templemore Town, agriculture and septic tanks. It should be noted that North Tipperary County Council recently upgraded the wastewater treatment plant, Foul and Storm-water Sewerage Collection for Templemore Town.

*Mostly satisfactory with further slight improvement, from Poor to Moderate ecological quality, at four locations. Overall quality was Good at 14 locations, Moderate at seven and Poor at one. Continuing polluted to some extent downstream of Templemore, in and downstream of Thurles as far as Holycross, at Ardfinnan and also just upstream of Carrick-on-Suir. The Suir runs through productive agricultural land as well as having sizeable towns along its course and has large filamentous algal growths in summer. It supports a large population of the protected crayfish.*

#### 9.3.4 Water Framework Directive

The European Communities Directive 2000/60/EC, which established a framework for community action in the field of water policy (commonly known as the WFD), requires 'good status' for all European waters by 2015 and where relevant deferred deadlines of 2021 and 2027. This is to be achieved through a system of river basin management planning and extensive monitoring. In 2004, a characterisation and analysis of all River Basin Districts (RBD) in Ireland was undertaken as required by Article 5 of the WFD. The Mall River is located in the Suir Upper Water management unit. In this characterisation study, the impacts of a range of pressures were evaluated including diffuse and point pollution, water abstraction and morphological pressures (e.g. water regulation structures). The purpose of this exercise was to identify water bodies at risk of failing to meet the objectives of the WFD by 2015, 2021 and 2027. Measures to address and alleviate these pressures are to be included in a formal programme of measures to be submitted to the European Commission. In relation to protected areas under the WFD, it indicates the following:

- There are no 'Registered Protected Areas' (RPA) nutrient sensitive rivers at or downstream of the proposed scheme works;
- There are RPA habitat rivers at or immediately downstream of the proposed scheme works; and
- There are no RPA nutrient sensitive lakes at or downstream of the proposed scheme works.

Based on the available information, the Mall River catchment is 'at Poor Status' in relation to Surface Water. It is proposed to restore the Mall River to good status by 2021. Based on the available information, the groundwater is 'at Good Status'. It is proposed to maintain the groundwater at good status. The main pressures on the Mall River are agricultural and waste water treatment plants (Suir upper water management Unit - SERBD, 2010).

#### 9.3.5 Characteristics of the Proposed Development

The Office of Public Works (OPW) has designed a Flood Relief Scheme for Templemore Town in accordance with the Arterial Drainage Act (1945) and the Arterial Drainage (Amendment) Act (1995).

In summary, the proposed Scheme will comprise of:

- Embankments upstream of the town, together with a ramp on Blackcastle Road, to prevent water flooding across the fields and down the Blackcastle Road into the town;
- A diversion channel to take floodwater, or the full river flow, from the embankments upstream of the town, through the town, to downstream of Small's Bridge;
- Walls and embankments upstream of Small's Bridge to protect properties;
- An embankment adjacent to Railway View Estate;
- Channel widening and regrading works within the Mall River south of Templemore Town; and
- Maintenance of channel and flood relief works.

These are described in more detail in Chapter 2 of this EIS.

No works are proposed for Templemore Lake.

## 9.4 Potential Impacts

Two flood relief scheme scenarios were considered in this assessment:

- A. The river will be left in its current channel route, with the new channel taking only flood flows;
- B. The river is diverted in full to the new channel.

The potential impacts during the construction phase for both scenarios mentioned above are similar and are therefore considered here together.

### 9.4.1 Construction Phase

The construction phase will entail the excavation of material for the installation of the diversion, installation of the diversion and construction of walls and embankments and construction of weir, channel constriction, road ramps, erosion protection works, channel widening and channel regrading, possible bridge works, and channel wall works. During the construction period, potential exists for discharge of sediment laden water from the site. This sediment laden water will be generated due to exposure of soil surfaces.

There is also the potential for a range of other pollutants to enter the river during construction work. Such pollutants would include uncured concrete, oils and construction debris. Machinery working within and near the river has the potential to produce pollutants both directly (from leaking fuels, oil spills, etc.) and indirectly, as a result of the drainage maintenance work (i.e. suspended solids, leached pollutants etc.). Any pollutants or accidental spills could potentially run untreated into the Mall River and subsequently the River Suir with serious negative consequences.

Mitigation measures will be undertaken to alleviate all potential impacts including silts traps. Details are outlined in Section 9.5 (Mitigation Measures).

#### 9.4.2 Operational Phase

Potential impacts on the existing fisheries have been identified and will be mitigated against in consultation with the Inland Fisheries Ireland (IFI) including stranding of fish, modification of watercourses and impacts on low flows. Both the full diversion and partial diversion scenarios are analysed below.

#### **Scenario A: Partial diversion into new channel (Flood Flow Diversion)**

##### North of Templemore Town.

The potential impacts of a flood flow diversion are similar to a full diversion scheme. The construction of the ramp on Blackcastle Road will have a positive impact as it will contain floodwaters during flooding events.

##### Partial diversion through the town.

In order to take floodwaters through the town without causing flooding, a partial diversion has been considered. These works will start upstream of the proposed embankments north of the town. In order to divert floodwater from the Mall River, a weir will be constructed on the right bank of the river. When the river is in flood and its level rises higher than the crest level of the weir, floodwaters will spill over the crest into a section of diversion channel. This partial diversion will take the floodwaters to a point downstream of the town. Under normal flow conditions, when the river level is below the weir crest level, all river water will remain in the old channel of the Mall. The diversion channel will only operate under flood conditions. The proposed Mall River will have a capacity of 5.5 m<sup>3</sup>/s and the storm diversion will have a capacity of 16.13 m<sup>3</sup>/s.

By preventing extreme flood water events from flooding properties, there will be a positive impact on the various properties within Templemore Town which have been flooded on a number of occasions within the last 150 years.

The proposed diversion will also have a potential positive impact on water quality. Located with the potential flood area of Templemore are the following businesses:

- Three No. Garages;
- Two No. Petrol Stations; and
- Two No. Laundrettes/Dry Cleaners.



Potentially polluting material are located and stored within these areas. These range from petrol and diesel, waste oil storage areas. Specific elements of hydrocarbon fuels and oils, such as polycyclic aromatic hydrocarbons (PAH's), benzene, ethylbenzene, toluene and xylene (BTEX) are harmful if they entered into the environment.

Potentially polluting material used within Laundrettes typically includes one of three cleaning solvents: Perchloroethylene, Petroleum solvents or Trichlorotrifluoroethane. By diverting the flood waters via the diversion, potential contaminants located within these properties will not become entrained within the flood waters. Further measures to prevent bank erosion may be required for the partial diversion option.

#### Small's Bridge area & South of Templemore Town.

When the diversion is in use at the discharge point, there is a potential for channel bank erosion during flooding events. Potential erosion of the bank and channel at this point will be mitigated against by a combination of gabion baskets and rock riprap. Where appropriate, riprap will be used instead of gabions for bank armouring works. The provision of riprap has significant benefits for fish (O'Grady, 2006).

By diverting the storm flow from flooding the town to a downstream location, the diversion has the potential to increase flood events at discharge point. This diversion will have the effect of removing the man made flow restriction (bridges, roads and buildings) on the Mall River.

As no upgrade works are planned for the CSO, it is proposed to connect the CSO to the new diversion channel. A partial diversion would have a minor negative potential impact on the scheme in comparison to the existing situation. This is principally due to the potential discharge of the CSO to an empty channel. CSOs typically coincide with periods of high river flows which would mitigate the potential impact however the discharge characteristics are not known for the CSO.

#### **Scenario B: Full river diversion into new channel**

##### North of Templemore Town.

The proposed works at this location consist of embankments and a road ramp on the Blackcastle Road. These works are required to prevent floodwaters flowing into the town. The construction of the ramp on Blackcastle Road will have a positive impact, as it will contain floodwaters during flooding events.

##### Full Diversion through the town.

In order to divert floodwater from the Mall River, a weir will be constructed on the right bank of the river. This new river, thalweg and river corridor will take the waters to a point downstream of the town. The proposed diversion will have a capacity of 21.63 m<sup>3</sup>/s. By preventing extreme flood water events from

flooding properties, there will be a positive impact on the various properties and water quality within Templemore Town which have been flooded on a number of occasions within the last 150 years.

The proposed diversion will also have a potential positive impact on water quality. Located within the potential flood area of Templemore are the following businesses:

- Three No. Garages;
- Two No. Petrol Stations; and
- Two No. Laundrettes/Dry Cleaners.

Potentially polluting material are located and stored within these areas. These range from petrol and diesel, waste oil storage areas. Specific elements of hydrocarbon fuels and oils, such as polycyclic aromatic hydrocarbons (PAH's), benzene, ethylbenzene, toluene and xylene (BTEX) are harmful if they entered into the environment.

Potentially polluting material used within Laundrettes typically includes one of three cleaning solvents; Perchloroethylene, Petroleum solvents or Trichlorotrifluoroethane. By diverting the flood waters via the diversion, potential contaminants located within these properties will not become entrained within the flood waters.

In addition during low flows the deepening of the river will have a minor beneficial impact on the low flows. Based on the hydrogeological characteristics of the soils and bedrock, low flow volumes may increase.

#### Small's Bridge area & South of Templemore Town

When the diversion is in use, there is a potential for channel bank erosion during flooding events at the discharge point. Potential erosion of the bank and channel at this point will be mitigated against by a combination of gabion baskets and rock riprap. Where appropriate, riprap will be used instead of gabions for bank armouring works. The provision of riprap has significant benefits for fish (O'Grady, 2006).

By diverting the storm flow from flooding the town to a downstream location, the diversion has the potential to increase flood events at discharge point. This diversion will have the effect of removing the man made flow restriction (bridges, roads and buildings) on the Mall River.

It is proposed to mitigate the potential impacts by improving flood defences at the downstream discharge point and by increasing the capacity of the river by channel widening. The Mall River channel bed will be widened to 7.5m along a 450m stretch and from there a transition returns to the existing

4.5m base wide over a further 250m (or so). The channel banks will be regraded to a 1 in 2 slope. Modification of the river bank over this 450m stretch may have a potential impact on river quality. Mitigation measures are proposed and the resultant impacts will be localised and low impact. The full river diversion also has a minor positive impact by eliminating erosion of the banks of the existing Mall River, which are being eroded by flood surge flows.

As no upgrade works are planned for the CSO, it is proposed to connect the CSO to the new diversion channel. The impact of the full diversion would have a negligible/neutral potential impact on the Mall River. CSOs typically coincide with periods of high river flows which would mitigate the potential impact however the discharge characteristics are not known for the CSO.

## 9.5 Mitigation Measures

A number of mitigation measures have been incorporated into and accounted for at an early stage of the design works in consultation with relevant bodies, and are listed below:

- Reinforcement (e.g. placed stone revetment or gabions) of opposite bank of the Mall to the outlet of the diversion to protect from erosion; and
- Channel works to prevent flooding of downstream locations.

Additional mitigation measures are detailed below to support where potential impacts cannot be designed out of the flood relief works.

### 9.5.1 Construction Phase

The construction phase of the proposed scheme will include the construction of the diversion channel and embankments and associated works adjacent to the Mall River, with channel works to the Mall River downstream. Without appropriate mitigation measures, the magnitude of this impact is considered moderate to high. Appropriate mitigation measures are proposed to ensure that discharges from the site are managed and regulated, so as to reduce the magnitude of the potential impact.

With regard to on-site storage facilities and activities, any raw materials, fuels and chemicals, will be stored within structurally sound warehousing buildings and/or bunded areas if appropriate to guard against potential accidental spills or leakages. All equipment and machinery will have regular checking for leakages and quality of performance.

Appropriate measures are required during the construction period to ensure that all potential run-off is diverted through appropriate settlement tanks/grit traps.

### Channel Works

Without appropriate mitigation measures, the magnitude of this impact is considered moderate to high. Specific aquatic ecology mitigation measures are detailed in Chapter 7 of this EIS. Measures to be used to protect the water environment during the construction works will follow the relevant section of the NRA's documents '*Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes*' (NRA, 2005). The fisheries board documents "*Maintenance and protection of the inland fisheries resource during road construction and improvement works. Requirements of the Southern Regional Fisheries Board*" (Kilfeather, 2007) and '*Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites*' (Murphy, 2004) would also be followed where relevant.

The river channel works will be carried out during dry weather and halted during heavy rainfall events to reduce suspended solids in the river and flowing to other parts e.g. the River Suir. Spoil and removed vegetation material from the river is to be stored no less than 5m back from the river and vegetation within this 5m buffer zone is to be retained, in order to reduce the run-off of suspended solids back into the watercourse.

All in-stream works must be carried out in accordance with an approved method statement and under the direction of Inland Fisheries Ireland (IFI) personnel.

### **9.5.2 Operational Phase**

The design of the proposed flood relief scheme has taken into account the potential impacts associated with the construction and operation of the scheme on the water environment.

Routine channel maintenance would be conducted as part of the operational phase. Routine channel maintenance will be based on guidance from the Regional Fisheries Board Guidelines (Murphy, D.F, 2004) and the Fishery Guidelines for Local Authority works (1998) where appropriate.

### **9.5.3 Monitoring**

During the works undertaken at the outset of the project, strict monitoring of all potential polluting materials used will be maintained.

### **9.5.4 Reinstatement**

Subject to the development of the site, in line with the proposed plans, there is no scope for reinstatement. The site will be permanently altered as a result of the scheme development.

## 9.6 CONCLUSIONS

Scenario B, diverting the river in full into the new channel, is the preferred option. The proposed flood relief scheme has developed a range of mitigation techniques to minimise impacts during construction and operational phases. These combined actions will provide benefits to the properties subject to flood both upstream of and within Templemore, and to the quality of water downstream of the town. Flood relief measures will remove the flow restrictions on the Mall River, such as those caused by narrow bridges. The benefits of the proposed flood relief scheme far outweigh the short term disruption of the flood relief works. It is considered that the proposed works will have a moderate beneficial impact on the water environment overall. No works are proposed for Templemore Lake and no impacts on this water body are predicted.



## 10 NOISE AND VIBRATION

### 10.1 Introduction

An assessment of the potential noise and vibration impacts associated with the proposed flood relief scheme in Templemore has been conducted on behalf of the Office of Public Works, (OPW).

The purpose of this assessment has been to:

- Establish existing noise levels in the area into which the scheme will be introduced;
- Address potential noise and vibration impacts to sensitive receptors; and
- Identify relevant attenuation measures where deemed necessary.

This evaluation was prepared in accordance with the Environmental Protection Agency's (EPA) *Guidelines on the Information to be contained in Environmental Impact Statements* (March 2002) and *Advice Notes on Current Practice (in the preparation of EIS)* (2003).

### 10.2 Study Methodology

A number of factors can influence the potential for noise impact from any proposed development such as the duration of the works, noise characteristics and perception. The impact and its effects is a subjective consideration. In order to minimise the impact on sensitive receptors, the potential for noise and vibration impact has been assessed, and a range of mitigating measures, which will ensure that acceptable noise limits are met, have been provided.

Noise surveys were recorded on the 24<sup>th</sup> of April 2014 at three locations along the proposed scheme route. The locations of the noise monitoring surveys are shown in Figure 10.1 overleaf.

Potential for noise and vibration impact in both the construction and operational phases of the proposed scheme has been assessed and specific noise and vibration mitigation measures have been presented. There is no significant noise and vibration associated with the operational phase of the scheme. During the construction phase the standards and guidelines appropriate for this appraisal are the: BS5228 *Code of Practice for Noise and Vibration Control on Construction and Open Sites – Part 1 and 2* (2009) and NRA *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (2004).

The latter is deemed suitable as it is commonly used for the construction phase noise and vibration impact assessment of schemes in Ireland and is designed for use with linear infrastructure, which the drainage scheme is.

### 10.3 Characteristics of the development

The town of Templemore, County Tipperary, lies on the Mall River, which drains a catchment area of 22km<sup>2</sup> that includes parts of the Kilduff and Devilsbit Mountains, before flowing into the River Suir two kilometres further downstream. The town has a long history of flooding, with a number of events having been reported over the last 150 years. The most significant of these occurred in December 1968, and more recently the November 2000 flood inundated approximately 40 properties.

The proposed scheme involves:

- A 60m-long inlet channel with Debris and Gravel Traps and a small Drop Weir.
- A new outflow from the lake to run under Blackcastle Road to the inlet channel.
- A flood-defence line north of the town, in line with a culvert over the new diversion.
- Relocating the river by constructing a new 805m long channel (with a 7.5m base width) that begins in Short's field and finishes approximately 230m downstream of Small's Bridge.
- The road and access bridges need to pass the full Climate Change flow of 21.63 m<sup>3</sup>/s.
- As the bypassed stretch of the river is no longer required, there are no residual flood risks from wall failure, etc. and no need to sluice its drainage outlets.
- At Richmond Road and Church Avenue, separated by 8.4m, walls along both banks of the diversion both up- and downstream.
- An embankment on the left bank (east side) below properties at Small's Bridge.
- Re-grading 480m of the channel from the new confluence to 740m below Small's Bridge. Over the same reach, widening the river to 7.5m and a further 250m from there to transition back to the existing 4.5m base width.
- Defence embankment in the Railway View Estate area.
- To improve aeration and fish movement along the excavated river and diversion, a 'Fish Channel' (Thalweg) will be dug and partially backfilled with gravels. While this will likely be about 0.3m deep with a 2m wide bed and up to 5 to 1 side slopes, it will be designed and constructed in consultation with the region's Fishery Board and, along the channel, may be higher or lower and its width may vary.
- Future growth of woody vegetation in the area downstream of the town must not encroach the river or damage the flowing floodplain. The channel from the upstream works to where the Mall discharges to the Suir is being designated for maintenance.
- Impacts to the landscape will be reduced by using high quality finishes to works, grassed finishes to embankments and open channel sections, and by planting replacement and new vegetation; including in-channel, where possible.

## 10.4 Existing Environment

The proposed scheme is located in a predominantly suburban area. Table 10-1 below will serve to quantify the typical noise levels encountered in the ambient environment. The values in Table 10-1 can be used to compare the predicted and measured noise levels presented in this chapter. Ambient noise levels at the properties located close to the majority of the route are characterised by transportation noise on the local supply roads and general environmental noise (i.e. wind in trees, children playing, dogs barking).

**Table 10-1 Guidance Note for Noise in Relation to Scheduled Activities, 2nd Edition, EPA 2006**

Typical Noise Levels in our Environment	
Sound levels in decibels dB (A)	Description of Activity
0	Absolute silence
25	Very quiet room
35	Rural night time setting with no wind
55	Day time, busy roadway 0.5km away
70	Busy Restaurant
85	Very busy pub, voice has to be raised to be heard
100	Disco or rock concert
120	Uncomfortably loud, conversation impossible
140	Noise causes pain in ears

### 10.4.1 Baseline Noise Survey

The measurement locations along the proposed scheme route represent individual properties or clusters of residential properties along the route. Refer to Table 10-2 and Figure 10-1 overleaf for monitoring locations. The dB LA90 noise levels presented in the Table 10-3 overleaf represent the existing 'background' noise levels within the area. The levels presented in terms of 'dB LA90' are defined as the background noise level at a location according to BS4142 (Method of Rating Industrial Noise Affecting Mixed Residential and Industrial Areas, British Standards Institute (1997)). A typical guide to environmental noise levels is presented in Table 10-1 above.

Attended noise measurements were recorded during day time at each noise monitoring location. The measurements taken were deemed to be representative of typical noise levels in the vicinity of the noise monitoring locations. The equipment used during this survey was a Cirrus Optimus Type CR171 Type 1 sound level meter.

All measurements were carried out in accordance with the International Organization for Standardization's (ISO) ISO 1996: *Acoustics - Description and Measurement of Environmental Noise*. Measurements were made by placing the microphone at a height of 1.5m above ground level. Measurements were free field and in all instances, the microphone was placed >2m from reflecting surfaces.

Before and after the survey, the measurement apparatus was checked and calibrated using a calibrator to an accuracy of  $\pm 0.3\text{dB}$ . Weather conditions during the surveys were in line with the conditions described within ISO 1996, *Acoustics - Description and Measurements of Environmental Noise*.

The measurement results were logged onto survey record sheets immediately following each measurement and also stored in the instrument's internal memory for subsequent analysis. Notes were also taken in relation to the primary contributors to audible noise at each monitoring location.

Environmental noise parameters were measured which are defined herein:

- $L_{Aeq}$  is the A-weighted equivalent continuous steady sound level during the measurement period and effectively represents an average ambient noise value;
- $L_{Amax}$  is the maximum A-weighted sound level measured during the measurement period;
- $L_{Amin}$  is the minimum A-weighted sound level measured during the measurement period;
- $L_{A10}$  is the A-weighted sound level that is exceeded for 10% of the measurement period and is used to quantify road traffic noise;
- $L_{A90}$  is the A-weighted sound level that is exceeded for 90% of the measurement period and is used to quantify background noise level.

A-weighting is the process by which noise levels are corrected to account for the non linearity of human hearing. All noise levels quoted are relative to a sound pressure of  $2 \times 10^{-5}$  Pa.

No tangible vibration was observed at any of the noise survey locations evaluated as part of baseline surveys.

### **Noise survey results**

Noise surveys were undertaken at three locations along the proposed route of the scheme. These locations are as detailed in Table 10-2 below and Figure 10-1 overleaf.

**Table 10-2 Noise Monitoring Locations**

Baseline Noise Monitoring Locations	
	Description
NSL1	Private house at northern end of Má Téine Housing estate
NSL2	Private house on Talavara Road
NSL3	Outside St Sheehan's College on N62 National Primary Road

**Figure 10-1 Noise Monitoring Locations**

The results of the noise monitoring surveys are detailed in Table 10-3 below.

**Table 10-3 Baseline Noise Monitoring Results**

Baseline Noise Monitoring Results						
	Time	L <sub>Aeq</sub>	L <sub>A90</sub>	L <sub>A10</sub>	L <sub>Amax</sub>	L <sub>Amin</sub>
NSL1	12:35	47.0	35.7	47.2	77.0	28.8
NSL2	13:10	59.8	39.4	64.5	78.1	31.7
NSL3	13:44	62.2	49.1	65.1	83.9	41.3

#### Location NSL1

Location NSL1 is a private dwelling situated at the Northern end of the Má Téine housing estate. This is the closest receptor to the proposed branch point from the existing natural river channel to the proposed realignment channel of the scheme.

The noise climate at NSL1 was characterised during the survey by birdsong, children playing on the grassed areas within the estate and by dogs barking. A train passed on the adjacent railway track along



the river, and sounded its horn during the survey. Distant road traffic noise was audible from outside the estate.

#### Location NSL2

Location NSL2 is a private dwelling on Talavara Road. The noise climate at this location was dominated by passing local traffic, birdsong and passing pedestrians. The noise climate at this location is dominated by road traffic noise as the elevated 64.5dB  $L_{A10}$  in Table 10-3 above shows.

#### Location NSL3

Location NSL3 is located outside St. Sheehan's College on the N62 near the point where the proposed scheme will traverse the N62 National Primary Road. Noise at this location was dominated by passing traffic on the N62, passing pedestrians and noise from Hassett's garage next door to the school. The noise climate at this location is dominated by road traffic noise as the elevated 65.1dB  $L_{A10}$  shows.

### 10.5 Potential Impacts

Two flood relief scheme scenarios were considered in this assessment:

- A. The river will be left in its current channel route, with the new channel taking only flood flows; and
- B. The river is diverted in full to the new channel.

It should be noted that the potential impacts are similar in both scenarios and they are therefore assessed together below.

The noise and vibration characteristics of the proposed scheme will be divided between the construction and the operational phases of the development. The principal predicted impacts for both noise and vibration will occur during the construction phase of the development.

The construction phase will involve excavation and general construction activities and is discussed further below (the construction details for the proposed scheme are set out in Chapter 2, of the EIS). The operational phase will not have any vibration impacts and will only have the potential for minimal noise impact, as described later in this chapter.

#### *10.5.1 Construction Phase Noise*

The construction phase of the proposed scheme has the potential to temporarily increase noise levels at noise sensitive locations surrounding the proposed scheme route. The nearest noise sensitive locations are located approximately 10m from proposed works.

Impact from the construction phase will depend on the number and types of equipment used during the construction of the proposed scheme. Construction noise sources will result in a temporary impact on the noise climate in the area. The temporary and transient nature of the construction phase on this type of development should not give rise to excessive construction noise levels for sustained periods of time. The lists of machinery as detailed in Tables 10-4 and 10-5 will form the significant plant which will be in operation during the construction phase.

**Table 10-4 Construction Phase Noise levels for trenching and channel excavation works**

BS5228 Calculations			Estimated Construction noise levels at varying distances $L_{Aeq,1hour}$		
Plant	Number of plant	Equipment on time	10m	20m	50m
Site Dump Trucks (x2)	2	25%	60	52	43
Articulated Dump Trucks (x2)	2	25%	62	54	45
Rigid Road Lorries (x3)	3	10%	52	44	34
25T Tracked Excavators (x4)	4	75%	65	57	48
14T Tracked Excavators (x2)	2	75%	54	46	37
Crane	1	20%	59	51	42
Concrete Pump	1	20%	59	51	42
Compressor	1	500%	57	49	40
<b>Combined Level dB <math>L_{Aeq,1hour}</math></b>			<b>69</b>	<b>62</b>	<b>52</b>

**Table 10-5 Construction Phase Noise levels for bridging and culvert works**

BS5228 Calculations			Estimated Construction noise levels at varying distances $L_{Aeq,1hour}$		
Plant	Number of plant	Equipment on time	10m	20m	50m
Site Dump Truck	1	25%	57	49	40
Rock breaker on Tracked Excavator	1	25%	70	62	53
Crane	1	10%	59	51	42
Concrete Pump	1	75%	59	51	42
Compressor	1	75%	57	49	40
<b>Combined Level dB <math>L_{Aeq,1hour}</math></b>			<b>71</b>	<b>63</b>	<b>54</b>

Predicted noise levels have been estimated using the methodology described in the British Standard BS5228: *Noise and vibration on construction and open sites*, Part 1 (2009). Predictions are based on typical equipment used during various construction stages of the proposed development. Predictions are based on a  $L_{Aeq,1hour}$  value with all machinery listed in Tables 10-4 and 10-5 operating for a proportional periods of 1 hour.

This may be considered a worst case scenario as this machinery will not all operate simultaneously. Additionally, calculations are based on minimum distances between site activities and the nearest noise

sensitive locations, with no allowance for screening of hedgerows, trees or buildings in between. An attenuation of 15dB has been assumed for the presence of acoustic hoarding around works close to sensitive receptors.

In Ireland, there are no statutory guidelines relating to noise limits for construction activities. These are generally controlled by local authorities and commonly refer to limiting working hours to prevent a noise nuisance. The National Roads Authority (NRA) *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* (2004) outlines recommended noise levels for construction noise during the construction of National Road Schemes.

Although the NRA's guidelines refer to road projects, they have been developed in line with typical construction noise limits on construction projects used previously in Ireland. The limits outlined represent a reasonable compromise between the practical limitations during a construction project and the need to ensure an acceptable ambient noise level for local residents. As a result, these limits have become the most acceptable standard for construction noise limits for EIS assessments in Ireland to date.

The NRA does note, however, that where pre-existing noise levels are particularly low, more stringent levels may be more appropriate. Table 10-6 below details these recommended limits.

**Table 10-6 Typical Maximum Permissible Noise Levels at the Façade of Dwellings during Construction Activities**

Day & Times	L <sub>Aeq,1hour</sub> dB	L <sub>Amax</sub> dB
Monday – Friday (07:00 to 19:00 hrs)	70	80
Monday – Friday (19:00 to 22:00 hrs)	60 <sup>1</sup>	65 <sup>1</sup>
Saturday (08:00 to 16:30 hrs)	65	75
Sundays and Bank Holidays (08:00 to 16:30 hrs)	60 <sup>1</sup>	65 <sup>1</sup>

<sup>1</sup> Construction activities at these times, other than that required in respect of emergency works, will normally require the explicit permission of the relevant local authority. Source: NRA *Guidelines for the Treatment of Noise and Vibration in National Road Schemes* 2004.

The assessment is considered to be worst case as the temporary nature of the construction period and the variety of machinery used should ensure that no construction activity is operational for long periods at individual receptors. Similarly all of the plant listed in Tables 10-4 and 10-5, will not be in use at the same stage of construction, as it is a phased process. Hence, the noise impact to be expected at the nearest noise sensitive receptor would be less than the worst case scenario described in Tables 10-4 and 10-5 above. This construction phase will therefore result in a significant, temporary, transient noise impact.

### **Construction Phase Road Traffic Noise**

There is a logarithmic relationship between noise levels and traffic volume whereby the higher the existing traffic volume, the greater the traffic increase required to produce a perceptible noise change. Typically, doubling the traffic flow produces a 3 dB(A) change in noise level. The maximum predicted HGV movements for the construction phase is of the order of 16 movements per day during the building of the access roads. After this, there will be a reduced number of HGV movements for the remainder of the construction phase.

The increase in noise levels resulting from construction road traffic on nearby roads will not be significant based on the road traffic noise levels in the existing environment. There will be no night-time construction traffic noise. There will be no significant noise and vibration impact from the operational phase of the scheme with regards to road traffic.

#### *10.5.2 Construction Phase Vibration*

There is potential for ground vibration due to the construction phase works, this will mainly be derived from excavation works at certain locations. Vibration may be defined as regularly repeated movement of a physical object about a fixed point. The magnitude of vibration is expressed in terms of Peak Particle Velocity (PPV) expressed in millimetres per second (mm/s).

Common practice in Ireland has been to use guidance from internationally recognised standards. Vibration standards come in two varieties, those dealing with human comfort and those dealing with cosmetic or structural damage to buildings. In both instances, the magnitude of vibration is expressed in terms of PPV in mm/s.

In order to ensure that there is no potential for vibration damage during construction, the NRA recommends that vibration from road construction activities be limited to the values set out in Table 10-7 overleaf. These values have been derived through consideration of the various international standards. Compliance with this guidance should ensure that there is little to no risk of even cosmetic damage to buildings.

These limits will be adhered to at all times during the construction phase of the project. There is no vibration impact predicted for the operational phase of the project.

There is a possibility that a small amount of localised rock breaking may be required if rock is encountered close to the surface construction. The potential noise impact from this has been accounted for above. Should the need arise for rock breaking; the process will be carried out so as to achieve adherence to the guideline vibration limits as presented in Table 10-7.

**Table 10-7 Allowable Vibration during Construction in Order to Minimise the Risk of Building Damage**

Allowable vibration velocity (Peak Particle Velocity) at the closest part of any sensitive property to the source of vibration, at a frequency of:		
Less than 10Hz	10 to 50Hz	50 to 100Hz and above
8mm/s	12.5mm/s	20mm/s

### **Operational Phase Noise**

There is no significant noise impact predicted to be emitted from the operational phase of the proposed scheme.

### **Operational Phase Vibration**

There is no significant vibration impact predicted to be emitted from the operational phase of the proposed scheme.

## **10.6 Mitigation Measures**

Relevant mitigation measures for each of the potential noise and vibration impacts as described above are provided below, to minimise the potential for impact to sensitive receptors.

### ***10.6.1 Construction Phase Noise Mitigation***

With regard to construction activities, the contractor appointed will ensure that all plant items used during the construction phase will comply with standards outlined in European Communities (Construction Plant and Equipment) (Permissible Noise Levels) Regulations (1990). The mitigation measures are outlined in BS5228: Noise Control on Construction and Open Sites (2009), which offers detailed guidance on the control of noise from construction activities.

It is proposed that various practices be adopted during construction including:

- Night time working will typically not occur, but there is the unlikely possibility that there may be a necessity to continue to operate generator, pumps or other equivalent machinery at a number of locations, where excavations etc may cause activity to remain in one location for a longer period of time;
- On these infrequent occasions, should they arise at all, screening and enclosures can be utilised. For maximum effectiveness, a screen should be positioned as close as possible to either the noise source or receiver. The screen should be constructed of material with a mass of  $>7\text{kg/m}^2$  and should have no gaps or joints in the barrier material. This can be used to limit noise impact to any noise sensitive receptors, if required by agreement with the local authority;



- Appoint a site representative responsible for matters relating to noise, and establish channels of communication between the contractor / developer, local authority and resident i.e. for notification of requirement of night works, should this be required; and

Furthermore, it is envisaged that a variety of practicable noise control measures will be employed, these may include:

- Selection of plant with low inherent potential for generation of noise and / or vibration;
- Erection of temporary barriers around items such as generators or high duty compressors. For maximum effectiveness, a barrier should be positioned as close as possible to either the noise source or receiver. The barrier should be constructed of material with a mass of  $>7\text{kg/m}^2$  and should have no gaps or joints in the barrier material; an example is shown below in Figure 10-2;

**Figure 10-2 Example of a Section of Temporary Noise Barrier**



- As a rough guide, the length of a barrier should be five times greater than its height. A shorter barrier should be bent around the noise source, to ensure no part of the noise source is visible from the receiving location;
- Locating of noisy plant as far away from sensitive receptors, as permitted by site constraints; and
- Noise and vibration monitoring works should be carried out during the construction phase to ensure adherence to the guidelines values for noise and vibration described above.

### *10.6.2 Construction Phase Vibration Mitigation*

Any construction works that have the potential to cause vibration at sensitive receptors will be carried out in accordance with the limit values as set out in Table 10-7 at the most affected sensitive receptor.

### *10.6.3 Operation Phase Mitigation*

Since no significant noise or vibration impacts are predicted for the operational phase of the proposed scheme, no mitigation measures for this phase are deemed necessary.

## **10.7 Residual Impacts**

Adherence to the mitigation measures as described above will ensure there are no residual noise and vibration impacts associated with the proposed scheme.

## **10.8 Conclusions**

An evaluation of the potential for noise and vibration impact to sensitive receptors from the proposed flood relief scheme (Viable Option 4) has been carried out. It is predicted that the proposed flood relief scheme as designed, inclusive of the mitigation measures described in this evaluation, will not have a significant noise and vibration impact on sensitive receptors.

## 11 AIR QUALITY AND CLIMATE CHANGE

### 11.1 Introduction

TOBIN Consulting Engineers were commissioned to undertake a desktop baseline air quality survey in order to assess the potential impact to air quality from the proposed flood relief scheme to be located in Templemore, County Tipperary. The objective of the flood relief scheme in Templemore is to alleviate the potential of flooding in the town of Templemore, County Tipperary. This report assesses the potential impact of the scheme in terms of its impact on air quality.

A desktop air quality assessment has been carried out with reference to EPA monitoring results of air quality in Ireland. The purpose of this assessment was to identify existing pollutant concentrations in the vicinity of the proposed scheme, and to assess the potential impact of the proposed scheme. This was undertaken to establish air quality information in order to determine compliance with relevant ambient air quality legislation.

In addition to the assessment of air quality parameters monitored by the EPA, a depositional dust survey was undertaken by TOBIN Consulting Engineers during the 2014 summer period using the Bergerhoff dust deposition assessment method, to provide a baseline assessment in relation to dust deposition.

This section should be read in conjunction with the scheme design plans.

#### 11.1.1 Air Quality Standards and Guidelines

The Environmental Protection Agency (EPA) is the competent authority responsible for the implementation of all Irish and EU ambient air quality legislation. The main air pollutants monitored by the EPA are sulphur dioxide, nitrogen oxides (NO<sub>x</sub>), particulate matter (PM<sub>10</sub>), ground level ozone, lead, carbon monoxide, black smoke and benzene. Apart from ozone, all of these pollutants result from the burning of fossil fuels, either from transport, domestic heating, electricity generating stations or industry. High ozone levels are formed from the reaction of two key pollutants nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOCs) in the presence of sunlight.

The EC has formally adopted the Air Quality Framework Directive (96/62/EC). The First Daughter Directive, 99/30/EC (adopted April 1999), set specific limits for: nitrogen dioxide (NO<sub>2</sub>), sulphur dioxide (SO<sub>2</sub>), particulate matter (PM<sub>10</sub>) and lead (Pb). In December 2001, the EC adopted the Second Daughter Directive, 2000/69/EC, relating to limit values for benzene and carbon monoxide (CO) in ambient air. The Third Daughter Directive 2002/3/EC, established target values and long term

objectives for the concentration of ozone in air. These directives have been transposed into Irish legislation by the Air Quality Standards Regulations, 2002 (SI No. 271 of 2002).

The Fourth Daughter Directive 2004/107/EC relates to arsenic, cadmium, mercury, nickel and polycyclic aromatic hydrocarbons in ambient air. This completes the list of pollutants initially described in the Framework Directive (96/62/EC). The Fourth Daughter Directive was transposed into Irish legislation by The Arsenic, Cadmium, Mercury, Nickel and Polycyclic Aromatic Hydrocarbons in Ambient Air Regulations 2009 (SI. No 58 of 2009).

The original Air Quality Directives (except the Fourth Daughter Directive 2004/107/EC) have been replaced by one overriding European Directive, known as the Clean Air for Europe Directive (CAFE Directive) (2008/50/EC) adopted in May 2008 (transposed as SI 180 of 2011). The EU intends to incorporate the Forth Daughter Directive into the CAFE Directive in the future. Within the CAFE Directive the specified limits for the protection of human health remain unchanged from those specified in SI No. 271 of 2002. These limit values are presented in Table 11-1.

**Table 11-1 Relevant Air Quality Standards and Guidelines**

Pollutant	Averaging Period	Standard ( $\mu\text{g}/\text{m}^3$ )
<b>Nitrogen Oxides (<math>\text{NO}_x</math>)</b>	1 hour	200
<b>Sulphur Dioxide (<math>\text{SO}_2</math>)</b>	24 hours	125
<b>Particulate Matter (<math>\text{PM}_{10}</math>)</b>	24 hours	50
<b>Carbon Monoxide (<math>\text{CO}</math>)</b>	8 hours	10,000
<b>Benzene (<math>\text{C}_6\text{H}_6</math>)</b>	Annual*	5
<b>Ozone (<math>\text{O}_3</math>)</b>	8 hours	120
<b>Lead (<math>\text{Pb}</math>)</b>	Calendar Year	0.5
<b>Cadmium (<math>\text{Cd}</math>)</b>	Concentration in the $\text{PM}_{10}$ fraction averaged over a calendar year	0.005**
<b>Nickel (<math>\text{N}</math>)</b>	Concentration in the $\text{PM}_{10}$ fraction averaged over a calendar year	0.02**
<b>Arsenic (<math>\text{As}</math>)</b>	Concentration in the $\text{PM}_{10}$ fraction averaged over a calendar year	0.006**

\* 5  $\mu\text{g}/\text{m}^3$  from the date of entry into force of these Regulations, reducing on 1 January 2006 and every 12 months thereafter by 1  $\mu\text{g}/\text{m}^3$  to reach 0  $\mu\text{g}/\text{m}^3$  by 1 January 2010

\*\* Target value effective from 31 December 2012

## 11.2 Existing Environment

The town of Templemore, County Tipperary, lies on the Mall River, and has a long history of flooding, with a number of flood events having been reported over the last 150 years. The most significant floods over the last 50 years occurred in December 1968 and then more recently in November 2000, when approximately 40 properties were inundated.

The Mall River is part of the Suir catchment and rises approximately 6km upstream of Templemore Town in the vicinity of the Devilsbit Mountains Special Area of Conservation (SAC); however the river itself is not designated as a conservation site. The Templemore Woods proposed Natural Heritage Area (pNHA) lies adjacent to Templemore Lake, directly north of Templemore Town. The River Suir is designated as a Special Area of Conservation (SAC) downstream of Thurles, County Tipperary, approximately 16km downstream from the confluence with the Mall River.

A desktop air quality assessment has been carried out with reference to EPA monitoring results of air quality in Ireland. Parameters were assessed having reference to the existing site conditions, the potential for traffic, residential and amenity derived pollution.

In addition, a total of four baseline locations were chosen to undertake a depositional dust survey, which was undertaken by TOBIN Consulting Engineers during the 2014 summer period using the Bergerhoff dust deposition assessment method. These locations are listed in Table 11-4. The four baseline depositional dust monitoring locations monitored and presented in Figure 11.1.

### 11.2.1 Baseline Air Quality

The EU Air Framework Directive requires Member States to categorise geographic areas in terms of Zone and Agglomerations for Air Quality. The proposed scheme falls into the area classified as Zone D – Rural Ireland. A detailed description of the Air Quality Zones is given on the EPA website. <http://www.epa.ie/air/quality/zones>

The proposed scheme is situated within the EPA's Rural East Air Quality Index for Health Region. The Air Quality for Health Index is described in detail on the EPA website. <http://www.epa.ie/air/quality/index>. Table 11-2 overleaf gives a summary description of the Air Quality Index for Health regions and the Air Quality Management Zones.

The most recent reporting by the EPA indicates that the current air quality in this region is classified as Good (EPA Air Quality Report 2012).



**Table 11-2 Air Quality Index for Health Regions & reference to Air Quality Zones**

AQIH Region	Definition	Comparison with Air Quality Management Zone
Dublin City	Dublin agglomeration from Shankill in south Dublin to Lucan in west Dublin to Swords in north Dublin.	Zone A Dublin conurbation
Cork City	Cork agglomeration incorporating Cork City Council jurisdiction with additional built-up areas.	Zone B Cork conurbation
Large Towns Population > 15,000	Galway, Limerick, Waterford, Clonmel, Kilkenny, Sligo, Drogheda, Wexford, Athlone, Ennis, Bray, Naas, Carlow, Tralee, Dundalk, Navan, Letterkenny, Celbridge, Newbridge, Mullingar, Balbriggan, Greystones, Leixlip and Portlaoise.	to Zone C Large Towns
Small Towns	Towns and cities with a population between 5,000 and 15,000.	to Zone D Rural Ireland
Rural West	Towns with population less than 5,000, villages and rural areas in Counties Clare, Cork, Donegal, Galway, Kerry, Leitrim, Limerick, Mayo, Roscommon and Sligo.	
Rural East	Towns with population less than 5,000, villages and rural areas in Counties Carlow, Cavan, Dublin, Kildare, Kilkenny, Laois, Longford, Louth, Meath, Monaghan, Offaly, Tipperary, Waterford, Westmeath	

**Table 11-3 Desktop data collection - Air monitoring stations in proximity to proposed scheme**

Monitoring Station	Proximity to Scheme	Air Quality Zone	Pollutants Measured	Monitoring Period
Clonmel, County Tipperary	Approx 50 km	Zone C	Benzene, NO <sub>2</sub> , SO <sub>2</sub> , CO, PM <sub>10</sub> , O <sub>3</sub> .	10/06/04 – 13/01/05
Mountrath County Laois	Approx 35 km	Zone D	Benzene, NO <sub>2</sub> , SO <sub>2</sub> , CO, PM <sub>10</sub> .	22/09/04- 14/06/05
Seville Lodge, Kilkenny	Approx 43 km	Zone C	Benzene, NO <sub>2</sub> , O <sub>3</sub> .	Continuous
Kilkitt, County Monaghan	Approx 160 km	Zone D	NO <sub>2</sub> , SO <sub>2</sub> , PM <sub>10</sub> , O <sub>3</sub> .	Continuous

**Table 11-4 Baseline dust monitoring**

Monitoring Location	Method	Parameter
D1	Monitoring using Bergerhoff gauges	Total Depositional Dust
D2	Monitoring using Bergerhoff gauges	Total Depositional Dust
D3	Monitoring using Bergerhoff gauges	Total Depositional Dust
D4	Monitoring using Bergerhoff gauges	Total Depositional Dust

Baseline dust monitoring, using the Bergerhoff depositional dust gauge method, was undertaken at four locations, as presented on Figure 11.1.

### **EPA Air Quality Monitoring Locations**

The proposed scheme falls into the area classified as Zone D – Rural Ireland. The EPA undertakes air monitoring at various sites nationwide. The most proximal air quality monitoring stations to the proposed scheme are listed in Table 11-3 and these sites act as a representative set of sites within Zone D (Rural Ireland) and Zone C (Large Towns). The data presented are the most recent data available and provide a reference of the air quality in relative proximity to the site.

Individual monitoring events were undertaken at the EPA Clonmel (Zone C) and Mountrath (Zone D) monitoring locations as shown in Table 11-3. Continuous and on-going air quality monitoring takes place at the EPA Seville Lodge monitoring location in Kilkenny (Zone C). The monitoring location that is currently used by the EPA to collate data on background air quality across a broad suite of air quality parameters for Zone D (Rural Ireland) is the Kilcitt air quality monitoring site in Monaghan (approx 160km from the proposed site) and reference is made to monitoring from that location also.

### **Benzene and Toluene**

The monitoring data in Table 11-5 for each EPA air quality monitoring station are in compliance with Irish and EU limit values (i.e. SI 271 of 2002 and EU Directive 2000/69/EC) for Benzene and are in compliance for occupational health as given in the notes above for Toluene.

**Table 11-5 Average Benzene and Toluene concentrations at EPA baseline monitoring stations**

Parameter	Mean hourly Measurement value			Lower assessment threshold value for the protection of human health for Calendar year	
	Mean hourly limit value	EPA Clonmel station	EPA Mountrath station	Averaging Period: 1 Jan 2014 - 31 Jul 2014	
				Lower assessment threshold value	EPA Seville Lodge, Kilkenny station
<b>Benzene (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>5<sup>1</sup></b>	0.20	0.30	<b>2.0</b>	0.11
<b>Toluene (<math>\mu\text{g}/\text{m}^3</math>)</b>	<b>4,700<sup>2</sup></b>	2.0	0.60	<b>No limit</b>	0.06

**Notes:** <sup>1</sup> denotes Irish and EU Ambient Air Standard (SI 271 of 2002 and 1999/30/EC);

<sup>2</sup> denotes No specific ambient air limits. Rule of thumb is using 1/40<sup>th</sup> of the 8-hour Occupational Exposure Limit as stated in the National Authority for Occupational Safety and Health 2002 "Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations". Toluene value is within its fractional exposure limit value

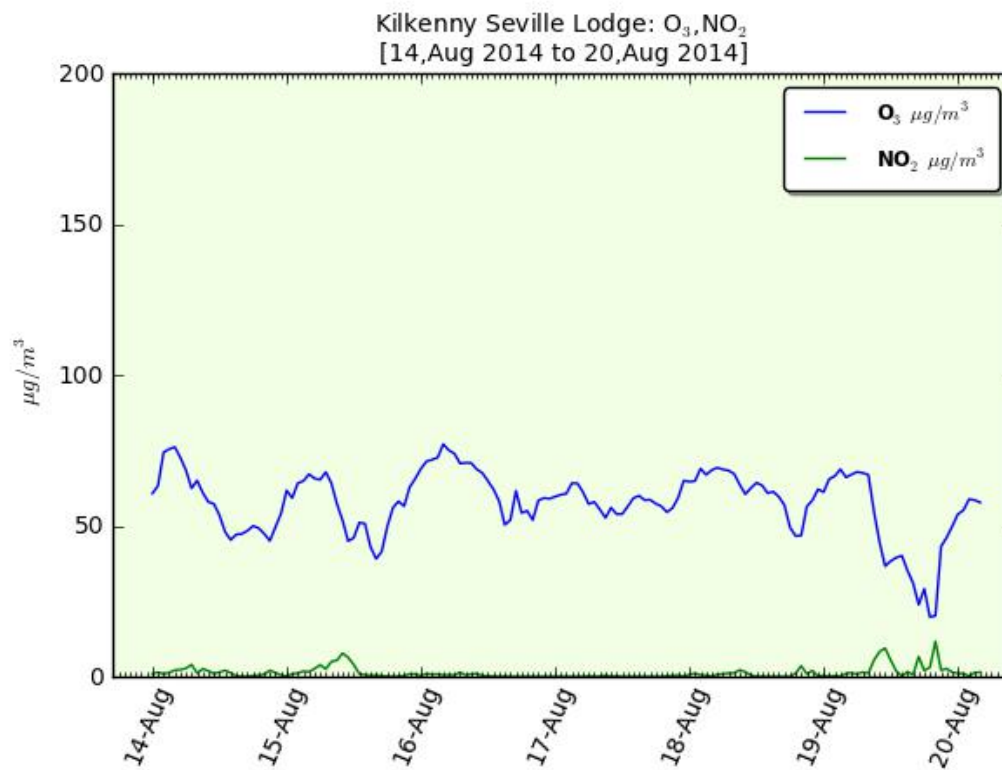
### **Nitrogen Dioxide**

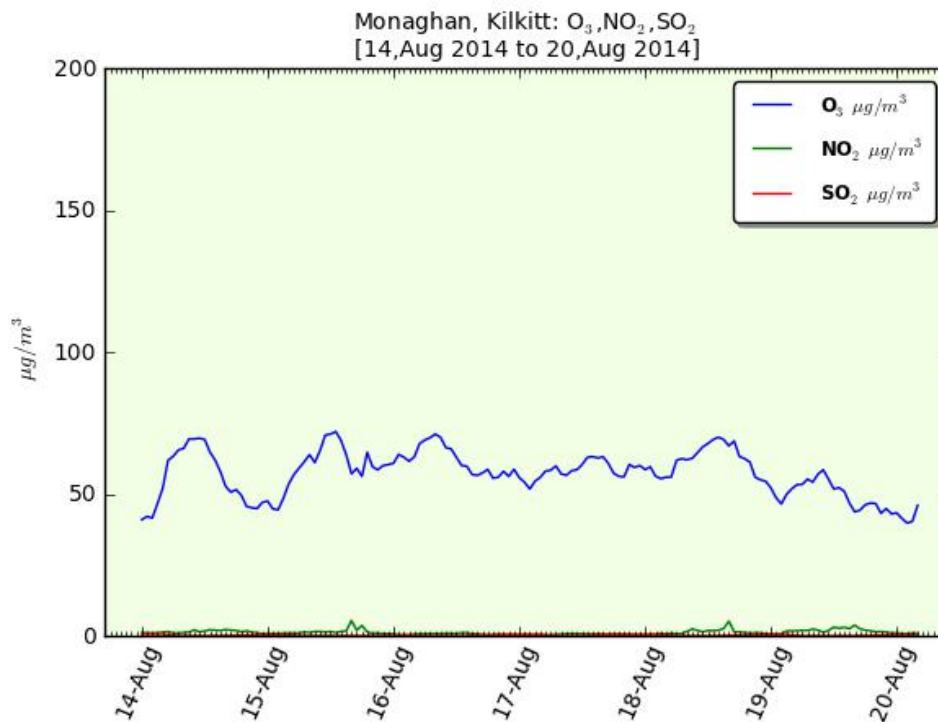
Monitoring data for Nitrogen Dioxide, mean hourly measurement values, from each of the monitoring events undertaken at the EPA Clonmel (10/06/04 – 13/01/05) and Mountrath (22/09/04 - 14/06/05) air quality monitoring stations are given in Table 11-6. The mean hourly measurement values for Nitrogen Dioxide at Clonmel and Mountrath were in compliance with Irish and EU limit values (i.e. SI 271 of 2002 and EU Directive 2000/69/EC). Continuous monitoring of Nitrogen Dioxide takes place at the EPA Seville Lodge, Kilkenny monitoring station (Zone C - Large Towns) and the EPA Kilkitt, County Monaghan (Zone D – Rural Ireland). The results from Kilkenny and Monaghan show that the Nitrogen Dioxide concentrations have been in compliance with the mean hourly limit value for the protection of human health for the year; a sample output of one week of the continuous monitoring results from the Kilkenny monitoring station is shown in Plate 11-1 overleaf. Information relating to the monitoring parameters, frequency and results from the Seville Lodge, Kilkenny monitoring site are available online at the EPA website. <http://www.epa.ie/air/quality/data/kk>

**Table 11-6 Average Nitrogen Dioxide concentrations at EPA baseline monitoring stations**

Mean hourly measurement value Nitrogen Dioxide ( $\mu\text{g}/\text{m}^3$ )				
Mean Hourly limit value for the protection of human health	EPA Clonmel station	EPA Mountrath station	EPA Seville Lodge, Kilkenny station	EPA Kilkitt station
<b>200<sup>1</sup></b>	10.0	12.5	See Plate 11-1	See Plate 11-2
Annual limit value for the protection of human health <sup>1</sup> (calendar year) 40 $\mu\text{g}/\text{m}^3$				

**Notes:** <sup>1</sup> Irish and EU Ambient Air Standard (SI 271 of 2002 and 1999/30/EC)

**Plate 11-1 EPA monitoring station, Seville Lodge, County Kilkenny - NO<sub>2</sub> monitoring**

**Plate 11-2 EPA monitoring station, Kilkitt, County Monaghan - NO<sub>2</sub> and SO<sub>2</sub> monitoring**

### **Sulphur Dioxide**

Monitoring data for Sulphur Dioxide mean hourly measurement values and maximum 24-hour value, from each of the monitoring events undertaken at the EPA Clonmel (10/06/04–13/01/05) and Mountrath (22/09/04–14/06/05) air quality monitoring stations are given in Table 11-7 below. Each of the mean hourly measurement values and maximum 24-hour values for Sulphur Dioxide at Clonmel and Mountrath were in compliance with Irish and EU limit values (i.e. SI 271 of 2002 and EU Directive 2000/69/EC). Continuous monitoring of Nitrogen Dioxide takes place at the EPA Kilkitt, County Monaghan (Zone D – Rural Ireland). The results from the Kilkitt air quality monitoring station show that the Sulphur Dioxide concentrations have been in compliance with the mean hourly limit value for the protection of human health for the year; a sample output of one week of the continuous monitoring results from the Monaghan monitoring station is shown in Plate 11-2 above. Information relating to the monitoring parameters, frequency and results from the EPA Monaghan monitoring site are available online <http://www.epa.ie/air/quality/data/kt>



**Table 11-7 Average SO<sub>2</sub> concentrations at EPA baseline monitoring stations**

Hourly limit value for the protection of human health SO <sub>2</sub> (µg/m <sup>3</sup> )				Daily limit value SO <sub>2</sub> (µg/m <sup>3</sup> )		
Hourly limit value	EPA Clonmel station	EPA Mountrath station	EPA Kilkitt station	Daily limit value	EPA Clonmel station	EPA Mountrath station
350	9.6	12.0	See Plate 11-2	<b>125<sup>1</sup></b>	3.0	3.9
Annual limit value for the protection of human health <sup>1</sup> (calendar year) 20 µg/m <sup>3</sup>						

**Notes:** <sup>1</sup> denotes Irish and EU Ambient Air Standard (SI 271 of 2002 and 1999/30/EC)

### **Carbon Monoxide**

Monitoring data for Carbon Monoxide, the maximum 8-hour running average, from each of the monitoring events undertaken at the EPA Clonmel (10/06/04 – 13/01/05) and Mountrath (22/09/04 – 14/06/05) air quality monitoring stations is given in Table 11-8 below. The maximum 8-hour running average for Carbon Monoxide at Clonmel and Mountrath were in compliance with Irish and EU limit values (i.e. SI 271 of 2002 and EU Directive 2000/69/EC).

**Table 11-8 Average CO concentrations at EPA air quality monitoring stations**

8-hour running average Carbon Monoxide (mg/m <sup>3</sup> )		
Limit value for the protection of human health (8 hr running average)	EPA Clonmel station	EPA Mountrath station
<b>10<sup>1</sup></b>	1.8	1.6

**Notes:** <sup>1</sup> Irish and EU Ambient Air Standard (SI 271 of 2002 and 1999/30/EC)

### **PM<sub>10</sub>**

Monitoring data for PM<sub>10</sub>, the maximum 24-hour running average, from each of the monitoring events undertaken at the EPA Clonmel (10/06/04 – 13/01/05) and Mountrath (22/09/04-14/06/05) air quality monitoring stations is given in Table 11-9 below. The maximum 24-hour running average for PM<sub>10</sub> at Clonmel and Mountrath were in compliance with Irish and EU limit values (i.e. SI 271 of 2002 and EU Directive 2000/69/EC).

**Table 11-9 PM10 concentrations at EPA air quality monitoring stations**

24-hour average daily value PM <sub>10</sub> (ug/m <sup>3</sup> )		
Limit value for the protection of human health (24 hour average)	EPA Clonmel station	EPA Mountrath station
50 <sup>1</sup>	20.1	22.5

**Notes:** <sup>1</sup> Irish and EU Ambient Air Standard (SI 271 of 2002 and 1999/30/EC)

### **Total Depositional Dust**

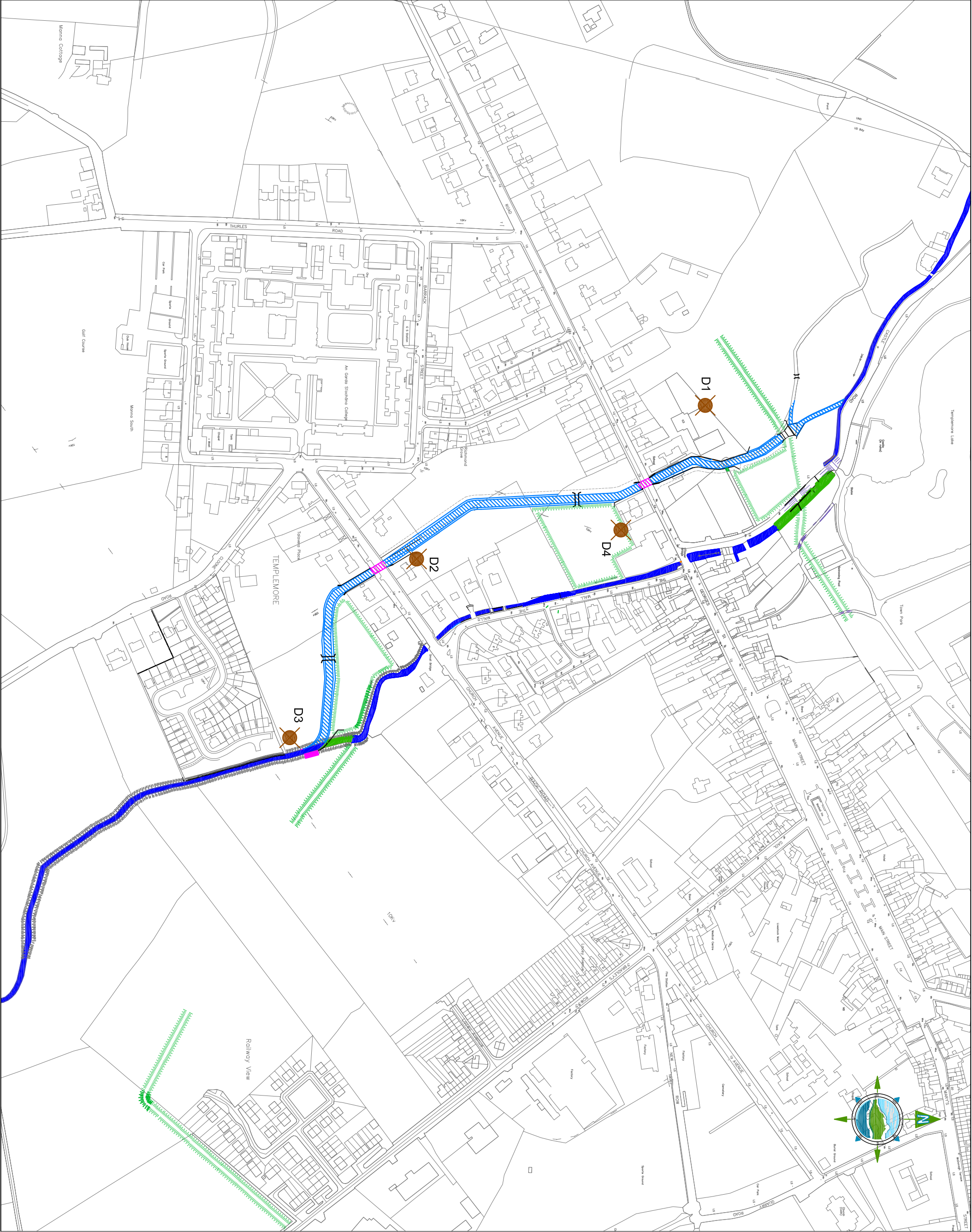
Currently in Ireland there are no statutory limits for dust deposition. However, in recent years, the TA Luft/VDI 2119/Bergerhoff Method of dust emission monitoring has become the most commonly used method. This method involves using a direct collection pot to standardised dimensions of either glass or plastic. The system benefits from being a direct collection method i.e. less transferring of material and consequent reduction in sampling errors. This method is defined as an internationally recognised standard and has been adopted by the Environmental Protection Agency (EPA) as the method of choice for licensed facilities.

EPA guidelines recommend that the TA Luft total dust deposition limit value (soluble and insoluble) of 350 milligram per square metre per day be adopted. This threshold has been widely applied by Irish Planning Authorities. This value was not exceeded at any of the survey monitoring locations.

**Table 11-10 Results of baseline Depositional Dust monitoring 20/06/14 to 18/07/14**


Reference	Monitoring Parameters (mg/m <sup>2</sup> /day)	Guideline limit value for Dust Deposition (mg/m <sup>2</sup> /day)
D1	63.4	350
D2	214.8	350
D3	167.9	350
D4	Jar broken during survey	350

Total dust deposition was measured between 20<sup>th</sup> June 2014 and the 18<sup>th</sup> July 2014 in the study area using Bergerhoff gauges specified in the German Engineering Institute VDI 2119 entitled "Measurement of Dustfall Using the Bergerhoff Instrument (Standard Method)." Samples were collected at four locations as shown in Figure 11.1 and the results recorded at each location are detailed in Table 11-10 above and Volume 3, Appendix 11.1. The purpose of these monitors is to assess the baseline total depositional dust in the vicinity of the proposed works. The glass jars containing the dust were submitted to an accredited test house for analyses. One of the monitoring jars, D4, broke during surveying so this location cannot be used.




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**LEGEND:**




RIVER



PROPOSED WORKS



PROPOSED EMBANKMENT



DUST MONITORING LOCATION

- NOTES:**
- FIGURED DIMENSIONS ONLY TO BE TAKEN FROM THIS DRAWING
  - ALL DRAWINGS TO BE CHECKED BY THE CONTRACTOR ON SITE
  - ENGINEER/EMPLOYERS REPRESENTATIVE, AS APPROPRIATE, TO BE INFORMED BY THE CONTRACTOR OF ANY DISCREPANCIES BEFORE ANY WORK COMMENCES
  - THE CONTRACTOR SHALL UNDERTAKE A THOROUGH CHECK FOR THE ACTUAL LOCATION OF ALL SERVICES/UTILITIES, ABOVE AND BELOW GROUND, BEFORE ANY WORK COMMENCES
  - ALL LEVELS SHOWN RELATE TO ORDNANCE SURVEY DATUM AT MALIN HEAD

Rev	Date	Description	By	Chk.
D01	30.07.14	Draft Issue for Review	NN	ONCA

Client:



**OPW**  
Office of Public Works

Project:

**TEMPLEMORE  
FLOOD RELIEF SCHEME**

Title:

**DUST  
MONITORING LOCATIONS**

Scale @ A:	1:4,000	
Prepared by:	Checked:	Date:
M. Nolan	O. McAlister	July 2014
Project Director:	D. Grehan	
Drawing Status:	Draft	



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Drawing No.: **Figure 11.1**

Revision: **D01**

### 11.2.2 Climate

#### **Climatic conditions**

Over the summer months the influence of anticyclonic weather conditions on the western and north western regions of Ireland results in dry continental air interspersed by the passage of Atlantic frontal systems. During much of the winter period the climate is characterised by the passage of Atlantic low-pressure weather systems and associated frontal rain belts from the west. Occasionally the establishment of a high pressure area or anticyclone over Ireland results in calm conditions and during the winter months these are characterised by clear skies and the formation of low level temperature inversions with light wind conditions at night time. If anticyclonic conditions become established for a few days or more during the summer months, high temperatures during the day might be recorded, especially at inland locations. Long spells of dry weather are relatively rare but should continental air masses or anticyclones persist over Ireland, a period of drought conditions may occur which could last up to two or three weeks.

#### **Weather Observing Stations**

##### **Rainfall Stations**

There are a number of rainfall measuring stations throughout the country. These stations measure the daily rainfall in millimetres (mm). A number of these stations also measure additional parameters such as soil moisture, temperature and humidity.

##### **Synoptic Stations**

There are currently 25 synoptic stations located throughout Ireland that observe and record surface meteorological data. Parameters observed include rainfall, temperature, wind speed and direction, relative humidity, solar radiation, clouds, atmospheric pressure, sunshine hours, evaporation and visibility. They report a mixture of snapshot hourly observations of the weather known as synoptic observations and daily summaries of the weather known as climate observations.

#### **Rainfall**

**Table 11-11 Meteorological stations near the proposed scheme**

Location	Grid Reference	Elevation (m O.D.)	Height Difference (m)
Templemore	S110 715	Average 110	-
Templetuohy	S189 709	97	3
Birr Synoptic Station	N074 044	73	37



There is no meteorological data specific to the existing site. In order to give reliable climatic data on a particular area a weather station should be within 10km of the site and in operation for at least 30 years. A climate station was located in Templetuohy G.S, approximately 8km east of the study site, which was in operation between 1943 and 1980. The nearest synoptic station is at Birr Synoptic Station and this is located approximately 35km north of the study area. Details for the rainfall station are outlined in Table 11-11 above.

The elevation of the rainfall gauge at Templetuohy measuring station is 97m O.D. The elevation of the study area at Templemore ranges between 100-120 O.D (Average taken at 110 O.D). The average monthly and annual precipitation recorded at Templetuohy measuring station is detailed in Table 11-12. According to Met Eireann, annual precipitation levels increase by 200–300mm per 100m elevation. The height difference between the rainfall gauging station and the average elevation in study area is approximately 3m. Therefore, the estimated annual precipitation due to the elevation of the proposed scheme was adjusted by 7.5mm (refer to Table 11-12).

**Table 11-12 Average Monthly & Annual Precipitation**

Location	Templetuohy Measured (mm rainfall)	Templemore Estimated (mm rainfall)
January	97	97.8
February	72	72.6
March	67	67.6
April	56	56.5
May	68	68.6
June	56	56.5
July	56	56.5
August	74	74.6
September	74	74.6
October	94	94.8
November	81	81.7
December	96	96.8
Annual mm	891	898.5
Station Ht. m O.D.	97	Mean elevation 110

In the vicinity of the proposed scheme, approximately 57% of the total annual rainfall is recorded during the winter period (October–March). This amount of precipitation (including snow) will normally be associated with more prolonged Atlantic frontal weather depressions passing over the region compared to the summer.



### **Evapotranspiration and Effective Rainfall**

The nearest meteorological station with evapotranspiration measuring equipment is located at the Birr Synoptic Station. Evapotranspiration is the return of water vapour to the atmosphere by evaporation from land and by the transpiration of plants, generally measured from a short-grass covered surface (such as a permanent pasture) adequately supplied with water. Evaporation is the return of water vapour to the atmosphere by evaporation from a free water surface such as a pan of water, known as a "Class A Pan", fitted with a depth measuring gauge. The potential evapotranspiration figures for the Birr Synoptic Station are detailed in Table 11-13.

**Table 11-13 Effective Rainfall for the proposed scheme**

Month	Estimated Rainfall (mm) At Scheme	Birr Potential Evapotranspiration (PE) (mm)	Actual Evapotranspiration (mm) (PE x 0.95)	Estimated Effective Rainfall (mm)
January	97.8	2.1	1.9	95.9
February	72.6	14	12.9	59.7
March	67.6	29.4	27.0	40.5
April	56.5	51.3	47.2	9.3
May	68.6	72.5	66.7	1.9
June	56.5	79.2	72.9	-16.4
July	56.5	75.5	69.5	-13.0
August	74.6	60.5	55.7	19.0
September	74.6	39.8	36.6	38.0
October	94.8	17.6	16.2	78.6
November	81.7	3.6	3.3	78.4
December	96.8	-0.7	-0.6	97.5
<b>Total</b>	898.5	444.8	409.2	489.3

It can be noted that evapotranspiration is very low during winter months, when temperatures are lower than summer months, relative humidity is generally higher and plant growth is minimal. The vast majority of evapotranspiration during winter months is attributable to direct evaporation from ground surfaces. During summer months the rate of evapotranspiration increases and often exceeds the monthly rainfall. This is due to increased free evaporation from the surface and from transpiration from leaves and plants.

Effective rainfall is defined as precipitation minus actual evapotranspiration and is given in Table 11-13 above. Using the estimated rainfall data in the vicinity of the proposed scheme and the potential

evapotranspiration data (i.e. the water flux under non-limiting soil conditions) for the nearest synoptic station i.e. Birr Synoptic Station, the effective rainfall for the study area can be calculated.

Any rain falling on the site will infiltrate to the ground, through the soil and subsoil, evaporate from the surface or become surface water runoff.

### **Wind**

The closest Met Eireann synoptic station with the capability of measuring wind and that has been in operation for at least 30 years is the Birr Synoptic Station. This station is located approximately 35km north of the proposed scheme and is located at an elevation of approximately 73m O.D. The wind rose for the Birr Synoptic Station shows that the prevailing winds are from the south. Refer to Volume 3, Appendix 11.2 for further details.

The mean monthly wind speed from 1971-2000 at the Birr Synoptic Station was 6.7 knots (3.4m/s). The elevation of the meteorological anemometer is approximately 12m O.D. These wind speeds are likely to be indicative of those in the vicinity of the scheme.

## **11.3 Characteristics of the Proposal**

The flood relief scheme consists of proposed works at a number of locations, which are detailed in Chapter 2 of this EIS.

## **11.4 Potential Impacts**

Two flood relief scheme scenarios were considered in this assessment:

- A. The river will be left in its current channel route, with the new channel taking only flood flows;  
and
- B. The river is diverted in full to the new channel.

It should be noted that the potential impacts are similar in both options and they are therefore assessed together below.

### **Construction Phase**

There is the potential for a number of emissions to atmosphere during the works with windblown dust being most significant. Windblown dust emissions may arise during the construction phase of the proposed scheme, which may impact upon the surrounding environment. The deposition of dust and mud on the local roads is both unsightly and dangerous. Dust may be a particular problem during periods of dry windy weather. There is no anticipated impact from dust emissions when the development has been constructed.

Potential sources of dust from construction and operation include the following:

- Vehicles carrying dust on their wheels;
- Un-vegetated stockpiles of construction materials; and
- The handling of construction materials for the construction phase of the development.

The construction vehicles and generators will also give rise to petrol and diesel exhaust emissions, although this is of minor significance compared to dust.

### **Operation Phase**

There will be no scheduled emissions following completion of the works.

There will be no impacts on macro climate following completion of the scheme.

#### *11.4.1 “Do-nothing” Scenario*

The baseline survey results suggest that air quality in the vicinity of the proposed scheme is good and shows typical levels for suburban area with all pollutants within the relevant Irish and EU limits (for similar sized population centres). The air quality may improve slightly in future years due to improvements in engine technology and greater controls on petrol, diesel, coal and gas composition and purity. If the proposed flood relief scheme were not to take place, the current air pollutant concentrations would remain unchanged followed by potential decreases in future years for the reasons outlined above. In relation to dust, non-development of the site would result in no movement of soils/sands/materials and no construction activity and therefore no dust creation as a result of construction works.

## **11.5 MITIGATION MEASURES**

### **Construction Phase**

The development of the flood relief scheme is likely to generate some dust emissions. The potential for dust to be emitted depends on the type of activity being carried out in conjunction with environmental factors including levels of rainfall, wind speed and wind direction. In order to ensure that no dust nuisance occurs, a series of measures will be implemented. Site roads shall be regularly cleaned and maintained as appropriate. Hard surface roads shall be swept to remove mud and aggregate materials from their surface as a result of the development works. Any un-surfaced roads shall be restricted to essential site traffic only. Furthermore, any road that has the potential to give rise to fugitive dust may be regularly watered, as appropriate, during extended dry and/or windy conditions.

A full traffic management plan and dust management plan will be implemented into the Construction Environmental Management Plan (CEMP) in order to minimise such emission as a result of the

construction phase of the development. This will be generated specifically for the development of the scheme when detailed design is completed.

Vehicles using site roads shall have their speed restricted, and this speed restriction must be enforced rigidly. On any un-surfaced site road and on hard surfaced roads that site management dictates speed shall be restricted to 20 km per hour.

Material handling systems and site stockpiling of materials shall be designed and laid out to minimise exposure to wind. Water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods.

In periods of dry weather when dust emission would be greatest, a road sweeper, which would also dampen the road, may be employed in order to prevent the generation of dust.

For construction and traffic-derived pollutants, the main period for potential impact will occur during the construction phase of the project. These emissions will be short term and primarily associated with the movement of construction material and construction traffic.

### **Operational Phase**

It is not anticipated that dust will be a significant problem following completion of the works as a result of the absence of scheduled emission points. There will be no other unscheduled emission points and therefore no residual impact on air quality.

There will be no emissions of greenhouse gases during operation of the flood relief scheme and therefore no residual impact on climate.

## **11.6 Residual Impacts of the Development**

### ***11.6.1 Predicted Impacts***

#### **Construction Phase**

The effect of construction of the scheme on air quality will not be significant following the implementation of the proposed mitigation measures. The main environmental nuisance associated with construction activities is dust. However, it is proposed to adhere to good working practices and dust mitigation measures to ensure that the levels of dust generated will be minimal and are unlikely to cause an environmental nuisance.

**Operational Phase**

There will be no scheduled emission point during the operation phase of the project. There will be no scheduled emission point during the operation phase of the project and therefore no greenhouse gas emissions.

*11.6.2 Monitoring***Construction Phase**

It is envisaged that the proposed scheme will not have a significant impact on the surrounding air quality. However, as discussed previously a number of dust mitigation measures have been suggested. Moreover, dust monitoring could be carried out during the construction phase of the scheme. If the level of dust is found to exceed 350mg/m<sup>2</sup>day in the vicinity of the site, further mitigation measures will be incorporated into the construction of the proposed flood relief scheme.

**Operational Phase**

As noted previously, there will be no scheduled emission point during the operation phase of the project and therefore it is not anticipated that depositional dust monitoring will be carried out during the operation phase of the flood relief scheme.

**11.7 CONCLUSIONS**

The potential impacts of developing the proposed flood relief scheme (Viable Option 4) are the same for Scenarios A and B as mentioned above. The effect of construction of the flood relief scheme on air quality will not be significant following the implementation of the proposed mitigation measures. Once operational, the proposed flood relief scheme will not have any impact on air quality or the local climate.



## 12 LANDSCAPE AND VISUAL IMPACT ASSESSMENT

### 12.1 Introduction

This chapter focuses on the landscape and visual aspects of the proposed flood relief scheme for Templemore, County Tipperary and was undertaken by URS Ireland. The following aspects will be addressed:

- Potential visual impact of the various measures on identified views;
- Potential impact on existing landscape character; and
- Proposed mitigation measures to reduce visual and landscape impacts.

This report uses the 'Guidelines on the Information to be contained in Environmental Impact Statements' prepared in March 2002 on behalf of the Environmental Protection Agency (EPA) as the basis for the landscape and visual impact assessment. The report recommends the use of defined terminology in the description of impact. The following defines the terms used in this section:

#### Likelihood of Impacts

- *Potential Impacts* - impacts arising before proposed mitigation measures become fully effective e.g. visual impacts before vegetation becomes established.
- *Residual Impacts* – final or intended impacts occurring after the mitigation measures have taken effect as planned e.g. establishment of tree screening

#### The quality of the impact may be described as:

- **Neutral** – A neutral impact will neither enhance nor detract from the landscape character or viewpoint.
- **Positive** – A positive impact will improve or enhance the landscape character or viewpoint.
- **Negative** – A negative impact will reduce or have an adverse effect on the existing landscape character or viewpoint.

#### The Duration of impacts is defined as follows:

- **Temporary** Impacts lasting one year or less.
- **Short Term** Impacts lasting one to seven years.
- **Medium Term** Impacts lasting seven to fifteen years.
- **Long Term** Impacts lasting fifteen to sixty years.
- **Permanent** Impacts lasting over sixty years.

also

- **Occasional**
- **Intermittent**
- **Continuous**

The Significance of impacts may be described as follows:

- **None** – There will be no change to an existing view. Arises where existing landform, vegetation or the built environment adequately screens the proposal.
- **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 that is consistent with existing and emerging trends.
- **High** – An impact which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
- **Profound** – An impact which obliterates sensitive characteristics.

Figures 12.1 to 12.9 which accompany this Chapter of the Environmental Impact Statement (EIS) are included in Volume 4 Photomontages.

## 12.2 Methodology

### 12.2.1 Study Methodology

This chapter of the EIS describes the existing landscape within the study area as defined by the OPW (refer to Figure 12.1). This includes the mapping of any designated areas, the assessment of the landscape character and the physical relationship between Templemore Town and the Mall River, as well as a listing of sensitive receptors to any work carried out along the river. This assessment was carried out following a desk study and site visit as described below.

### 12.2.2 Desk Study

A desktop study of the North Tipperary County Development Plan 2010-2016 including relevant published literature was carried out. Key landscape characteristics such as vegetation, major and minor ridgelines, land uses, designations and settlement areas were mapped. This was carried out using OS 1:50,000 and 6" mapping of the area and aerial photography. The County Development Plan contains a number of designations. These are listed overleaf under Section 12.3.1.

### 12.2.3 Site Visit

A visual survey of the study area as defined by the OPW was carried out by the author in May 2014 and July 2014. Conditions during the site visit were overcast to bright with good visibility. Key features of the landscape and critical view corridors were assessed and the relationship between the river and the landscape was examined. Photographs were taken using the digital equivalent of a 50mm fixed lens.

## 12.3 Existing Environment

There are no protected views and prospects or scenic routes listed within the study area.

### 12.3.1 Landscape Character

#### Within Templemore Town

Urban layout – Templemore is a small rural town. The layout of the main streets is typical of many towns of similar size throughout Ireland. The streets contain a mixture of traditional and modern shop-fronts and buildings are not higher than two stories. Beyond the main streets, the wider rural landscape of field and hedgerow is often visible from points within the town.

Vegetation – Within the main streets of the town, buildings face directly on to the road, and there is little street vegetation. The more residential parts of the town offer space for front gardens and vegetation facing the road. Some roads are laid out as avenues.

Boundaries – Most of the properties in Templemore border onto an open field to the rear. Boundaries to neighbouring properties are usually marked with fences, walls and/or hedgerows. In the more built up parts of the town, buildings are attached.

Topography – Overall, Templemore is relatively flat with the lands very gently rising towards Templemore Park and the Priory Demesne to the north and west of the town centre. In the south-western part of Templemore, the land falls gently towards the River Suir.

Landscape scale – Templemore is generally flat and because of the restrictions to views by buildings and vegetation, the landscape scale is rather small and any new features within a particular viewpoint could be quite noticeable. There are views, however, of the mountain range to the northwest of Templemore from several locations within the town, which open up the views and widen the experienced scale of the landscape.

Hard landscape – There is a mixture of different types of footpaths, wall and street furniture within the town. In parts of Templemore, there is a certain amount of visual confusion caused by signs, poles and the large number of overhead wires. There is a tradition of limestone wall building within the town, particularly around the river, as seen in the photographs overleaf.



### Around Templemore Town

Rural layout – The landscape around Templemore mainly consists of medium to large agricultural fields with pastureland being the dominant land-use. There are also scattered deciduous woodlands throughout the area and fields are divided by native hedgerow. The pattern of field and hedgerow is of a more linear nature than in other parts of the country. The numerous former demesnes in the area may have contributed to this form of regular layout.

Vegetation – Vegetation outside Templemore is made up of deciduous hedgerows and trees as well as large areas of grassland. In lower lying areas, vegetation associated with water retaining soils is prevalent.

**Boundaries** – Most of the field boundaries are marked with mature hedgerows with tall trees. Some of the fields are bounded by limestone walls.

**Topography** – The topography around Templemore is generally flat but undulating. Devilsbit Mountain, a part of the eastern foothills of the Silvermines Mountains, rises up to 480m AoD, approximately 6km to the northwest of Templemore and is therefore the dominant feature in any views from within the study area.



**Landscape Scale** – The landscape scale is generally quite large as there are many views of the mountain range to the northwest of Templemore as well as partly open views of the lower lying landscape from this mountain range. Vegetation and topography often restrict views into the wider landscape and therefore new structures within these more enclosed views could become dominant in scale.

**Hard landscape** – A network of roads ranging from a National road (N62) to third class and private roads, cross the study area. A number of fields are bounded by limestone walls.

### *12.3.2 Areas designated for ecological value*

While the sites listed below are primarily designated for the ecological value, they also tend to represent areas of landscape value.

#### Proposed Natural Heritage Areas (pNHAs)

000942 – Templemore Wood.

A deciduous woodland within Templemore Park located northwest of the town centre and within the study area.



### Protected Trees

T38 – Trees at Harneys of Manna.

T39 – Trees at Belleville, Templemore.

T40 – Trees in grounds of Barnane House, Templemore.

## 12.4 Potential Impacts

The following sections examine the potential landscape and visual impacts of the proposed scheme within the subject area, both in terms of construction phase impacts and potential impacts upon completion of works.

Two scheme scenarios are assessed under the following headings:

- Impacts shared by both scenarios; a full river diversion, and a flood flow channel;
- Impacts of existing river route remaining, with the new channel only taking flood flows (Scenario A); and
- Impacts of existing river being fully diverted to the new channel (Scenario B).

### *12.4.1 Impacts shared by both scenarios; a full river diversion and a flood flow channel*

#### **North of Templemore: the construction of the flood defence ramp and raising of walls on Blackcastle Road (refer to Figure 12.2)**

At this point, North of Templemore Town, the road ramp together with the increase in wall height will be visible to road users, pedestrians and property owners on Blackcastle Road. The road ramp and new higher wall will also be visible to users of the town park. The removal and replacement of a 33m section of wall on both sides of the road, will add to the visual change in this location.

#### **Construction Phase Visual Impacts**

The construction of the proposed flood defence road ramp, together with raised walls on each side of Blackcastle road just North of Templemore adjacent to the entrance to Templemore Park will be visible to road users and park users.

Quality of impact: negative.

Duration of impact: temporary.

Significance of impact: slight to moderate/high.

#### **Potential Impacts (refer to mitigation measures Section 12.5.1)**

Quality of impact: neutral.

Duration of impact: long term.

Significance of impact: slight to moderate.

**North of Templemore: the construction of the flood defence embankments*****Embankment and deposition area west of Blackcastle Road in Shortt's Field (refer to Volume 4 - Figure 12.5)***

The proposed embankment and deposition area here will be visible to both road users and pedestrians using the footpath along the road.

**Construction Phase Visual Impacts**

The construction of the flood defence embankment approximately 0.8m - 1.2m high and with a 4m-wide crest, running 190m southwest across lands northwest of Templemore will be visible to road users of Blackcastle Road and from the rear of properties and the school on the northern side of Richmond Road.

Quality of impact: negative.

Duration of impact: temporary.

Significance of impact: slight to moderate.

**Potential Visual Impacts (refer to mitigation measures Section 12.5.1)**

Quality of impact: neutral.

Duration of impact: permanent.

Significance of impact: slight to moderate.

***Embankment east of Blackcastle Road in the Town Park (refer to Volume 4 - Figure 12.4)***

The Town Park embankment will run for approximately 132m from the road edge, crossing the short in-filled stretch of the Mall River at this location, to tie in with high ground to the south east of the lake, with an average height of 0.75m above ground level. The flood defence embankment will impact on views from within Templemore Park (refer to Volume 4 Figure 12.4), and will also be partially visible to pedestrians and road users on Blackcastle Road (refer to Volume 4 Figure 12.2). The extension of the embankment to cross this section of the in-filled river channel will result in a breach of the existing park boundary, including mature tree planting, increasing the visibility of the embankment structure from the road. An existing access route within the park will be severed by the embankment, with access being provided via a ramped path over the structure.

**Construction Phase Visual Impact**

Quality of impact: negative.

Duration of impact: temporary.

Significance of impact: slight to moderate.

**Potential Visual Impacts (refer to mitigation measures Section 12.5.1)**

Quality of impact: neutral.

Duration of impact: permanent.

Significance of impact: slight to moderate.

**North of Templemore: Filling in of Mall River (refer to Volume 4 Figure 12.2)**

A small section of the Mall River will be in-filled to both improve access to the town park and serve as a surface to extend the flood defence embankment at this location. The filling in of the existing open channel will result in a change from an open river channel to a linear strip of land between the road and the town park. This will be experienced by park users, pedestrians and road users.

**Construction Phase Visual Impact**

Quality of impact: negative.

Duration of impact: temporary.

Significance of impact: slight to moderate.

**Potential Visual Impact**

The filling in of this section of existing river channel will potentially extend the footprint of the town park towards the road. As it has been decided to retain the existing river wall between the park and existing river channel, the in filled section here will be experienced as an isolated linear strip, breaching the existing line of the park along the river channel, which includes mature tree planting. If it is decided to have mown grass in this area as in the adjacent park, it will be important to consider the maintenance of the area and access should be provided for appropriate machinery. Alternatively, the area could be left to naturally regenerate, developing a scrub-like character. The retention of the existing river wall here could aid in the accumulation of debris such as leaf litter and rubbish.

Quality of impact: neutral.

Duration of impact: permanent.

Significance of impact: moderate.

**The Inlet to the Flood Diversion Route, Culvert, Control Weir and Fish Pass (refer to Volume 4 Figure 12.3)**

The construction of a 4m-wide Connector Channel will start 60m upstream of Shortt's Bridge. Due to the change in upstream and downstream bed levels at this point, a control weir will facilitate the level change, and will be 0.75m in height. The structure will be mainly covered within the proposed embankment at this location. A safety wall is located on top of the embankment. This vertical element will be visible from Blackcastle Road (refer to Figure 12.4). The concrete structure of the weir/culvert, with

large open faces flanking the openings on both sides, will be partially visible by both road users and pedestrians on Blackcastle Road.

**Construction Phase Visual Impact**

Quality of impact: negative.

Duration of impact: temporary.

Significance of impact: moderate to high.

**Potential/Residual Impacts (refer to mitigation measures Section 12.5.1)**

Quality of impact: neutral.

Duration of impact: permanent.

Significance of impact: slight.

**Bypass Diversion through Town (refer to Volume 4 Figure 12.6 and 12.7)**

The bypass diversion through the town will involve the construction of defence walls on both banks of the diversion upstream of Richmond Road, and on the left bank of the diversion downstream of Richmond Road (refer to Volume 4 Figure 12.6). The bypass diversion will be visible to road users and properties along Church Avenue, Richmond Road and on the western side of The Mall. The construction of the bypass will involve the removal of existing vegetation and will have significant visual impact on road crossings at Church Avenue and Richmond Road. The culvert diversion will be placed along the boundary line between two existing properties on the northern side of Church Avenue and will run through the garden of an existing property on the south side of the road (refer to Volume 4 Figure 12.7). Existing hedgerows will be removed where it is proposed to route the culvert diversion on the north side of Richmond Road.

**Construction Phase Visual Impact**

Quality of impact: negative.

Duration of impact: temporary.

Significance of impact: moderate to high.

**Potential/Residual Impacts (refer to mitigation measures Section 12.5.2)**

Visual impacts will be experienced by road users and from properties along Richmond Road and Church Avenue.

Quality of impact: neutral.

Duration of impact: permanent.

Significance of impact: slight.

**South of Templemore Town****Construction of Flood Defence Embankment at the confluence point south of Small's Bridge.**

The proposed embankment at this point is located within a field which is not visible from the surrounding public roads. The structure will only be visible to the rear of properties located on Church Road.

**Construction Phase Visual Impacts**

It will be necessary to remove the mature hedgerow and the ornamental planting including mature trees existing in three of the gardens along the Mall River. Visual impacts will be only experienced by road users and from properties along The Mall.

Quality of impact: negative.

Duration of impact: short term.

Significance of impact: high.

**Potential/Residual Visual Impacts (refer to mitigation measures Section 12.5.3)**

Quality of impact: neutral.

Duration of impact: long term.

Significance of impact: slight to moderate.

**The junction of the diversion channel, deposition area, erosion protection, widening of the channel and flood embankment (refer to Volume 4 Figure 12.8)**

The location of the junction of the diversion channel, erosion protection and the widening of the channel are not visible from any location south of Templemore Town. Potential views are screened by intervening hedgerows and a wooden fence approximately 2m high on the boundary of the new housing estate just off Cloone Road with the river. For the purposes of visualisation, a viewpoint was taken from the lands between the rear of properties on Church Road, and the proposed diversion channel, where a potential deposition area is proposed (refer to Volume 4 Figure 12.8). On the opposite side of the channel opening, a section of the bank is reinforced with rock to prevent erosion.

**Construction Phase Impacts**

Quality of impact: negative.

Duration of impact: temporary.

Significance of impact: slight to moderate.

**Potential/Residual Impacts (refer to mitigation measures Section 12.5.3)**

Quality of impact: neutral.

Duration of impact: long term.



Significance of impact: slight to moderate.

***Construction of 217m long flood defence embankment southwest of Railway View (refer to Volume 4 Figure 12.9)***

Railway View Estate will be protected by an embankment that runs approximately 110m along its southwest side, turning to run a further 217m along its southeast side and finishing at the road edge. This embankment will be visible to users on Railway Road and from the rear of the properties on the southeastern boundary of Railway View Estate. The open green character of the site, with existing strong boundary planting helps tie the embankment into the site and reduce its visual impact.

***Construction Phase Visual Impact***

Quality of impact: negative.

Duration of impact: temporary.

Significance of impact: slight to moderate.

***Potential Visual Impacts (refer to mitigation measures Section 12.5.3)***

Quality of impact: neutral.

Duration of impact: permanent.

Significance of impact: moderate.

***Maintenance of Channel***

It is a provision within both options being assessed, that the future growth of woody vegetation in the downstream area must not encroach into the river or interfere with the floodplain. For this reason, 1.5km of the existing river channel, south of Small's Bridge is being designated for maintenance. Views to the channel are restricted by intervening vegetation and buildings, and therefore have limited visual impact.

***Potential Visual Impacts***

Quality of impact: neutral.

Duration of impact: temporary.

Significance of impact: slight.

***12.4.2 Scenario A: Impacts of existing river route remaining, with the new channel taking only flood flows***

***Bypass diversion through town***

With the existing river route remaining, and with the new channel taking only flood flows, the culvert area at Richmond Road will be larger in size. This culvert portion will run from the roadway edge at

Hassett's Tyre Garage, across Richmond Road, continuing the entire length of the adjacent property boundaries. An open channel will remain at the roadside edge, upstream of Richmond Road. At the Church Avenue section of the crossing, the culvert portion is considerably larger to that in Scenario A, running the length of the adjacent properties on both sides of Church Avenue. These culvert/channel sections will cause significant change to the areas and will be visible in views from properties, and to roadway users, and pedestrians. The removal of existing vegetation in private gardens, together with the removal of existing walls, pavement, and roadway surfaces will be necessary.

#### Construction Phase Visual Impact

Quality of impact: negative.

Duration of impact: temporary.

Significance of impact: moderate to high.

#### Potential/Residual Impacts (refer to mitigation measures Section 12.5.2)

Visual impacts will be experienced by road users and from properties along Richmond Road and Church Avenue.

Quality of impact: neutral.

Duration of impact: permanent.

Significance of impact: slight.

#### South of Templemore

##### ***The construction of an embankment upstream of Small's Bridge.***

The construction of an embankment approximately 0.75m in height will run upstream on the right bank for approximately 46m from Small's Bridge along three property boundaries. The removal of existing boundary vegetation from private gardens will be necessary for embankment. Visual impacts will be experienced from the associated properties and from road users and pedestrians along The Mall.

#### Construction Phase Visual Impacts

Quality of impact: negative.

Duration of impact: temporary.

Significance of impact: high.

#### Potential/Residual Impacts (refer to mitigation measures Section 12.5.3)

Quality of impact: neutral.

Duration of impact: long term.

Significance of impact: moderate.

***The construction of flood defence walls and reinforcing of river bank to protect properties.***

Flood defences are needed downstream of Small's Bridge to cope with water loading and erosion. A 53m wall along the right bank property boundary will tie into an embankment that continues the line of defence for approximately another 55m and a 128m long wall along the left bank property boundary, this wall then continues for approximately another 26m to tie into a 90m long embankment. The construction of the flood defence walls to the two private properties south of Small Bridge will be only visible from the associated properties.

**Construction Phase Visual Impacts**

Quality of impact: negative.

Duration of impact: temporary.

Significance of impact: slight to moderate.

**Potential/Residual Visual Impacts**

Quality of impact: neutral to positive.

Duration of impact: permanent.

Significance of impact: slight.

***12.4.3 Scenario B: Impacts of existing river being fully diverted to the new channel*****Bypass diversion through town (refer to Volume 4 Figure 12.6 and 12.7)**

With the existing river fully diverted to the new channel, the culverted area at Richmond Road will be significantly reduced in length in order to provide for fish movement. The culverted area will be contained to the roadway portion only, leaving the upstream and downstream areas at either side of the road as exposed uncovered channel (refer to Volume 4 Figure 12.6). At the Church Avenue section of the crossing, again the culverted portion is limited to the roadway area between property boundaries, with an uncovered channel at either side (refer to Volume 4 Figure 12.7). The removal of existing vegetation in private gardens, together with the removal of existing walls, pavement, and roadway surfaces will be necessary. These culvert/channel sections will cause significant change to the areas and will be visible to properties, roadway users, and pedestrians.

**Construction Phase Visual Impact**

Quality of impact: negative.

Duration of impact: temporary.

Significance of impact: moderate to high.

**Potential/Residual Impacts (refer to mitigation measures Section 12.5.2)**

Visual impacts will be experienced by road users and from properties along Richmond Road and Church Avenue.

Quality of impact: neutral.

Duration of impact: permanent.

Significance of impact: moderate.

**Existing River Mall channel fully diverted with no flow remaining**

As a full river diversion is to take place, the existing river channel in the town will become empty of water. The future use of the river channel has been deemed outside the scope of this EIS, and a matter for Tipperary County Council to address at a later date.

**Potential Impacts**

The assessed impacts relate to those arising from the removal of water from the existing channel in the town, the future use of the channel is not assessed, as this is a future matter for Tipperary County Council. Visual impacts will be experienced by park users and pedestrians walking alongside the river route.

Quality of impact: negative

Duration of impact: permanent.

Significance of impact: moderate

**12.4.4 Limitations to Assessment**

During this Landscape and Visual Impact Assessment, the following limitations were encountered.

**The Inlet to the Flood Diversion Route, Culvert, Control Weir and Fish Pass**

Although efforts have been made to visualise the control weir and culvert structure at this location, no detail drawings or standard details were available which would enable the most accurate representation of the structure within the landscape. On request, the structure has been modelled based on a photograph of a similar structure from another project. Until specific details can be provided for this section of the scheme, the assessment is general here due to a lack of detailed design information.

**The Filling in of The Mall River north of Templemore at the Town Park**

The proposed scheme includes the full diversion of the existing river into a new channel through Templemore. Although the future use of the existing channel has been deemed outside the scope of this EIS, this portion of in-filled river channel will potentially extend the footprint of the park towards the road. No information has been provided relating to barrier protection at this location between the extended park area and both the road and dry river channel.

### **Bypass Diversion through Town**

In both the full river diversion and a flood relief channel scenarios, the proposed diversion through the town offers no barrier protection at the crossing points at Richmond Road, and Church Avenue. Without this information, an accurate assessment of the landscape and visual impact at these points cannot be provided. Specific details, materials, and finishes of walls, fences or railings would be required to fully understand the significance of impacts at these locations.

#### *12.4.5 Landscape Impact*

The implementation of the flood defence measures outlined in this report would have numerous impacts on the current landscape of Templemore both at a construction phase and after works are complete. The series of proposed embankments to both the north and south of the town will not only change the local topography of the area concerned, but will also require the removal of trees and mature hedgerows.

To the north of the town, the raising of walls, river walls, and the introduction of a road ramp will change details in the fabric of the landscape. The raised road surfaces will change both the physical road level and also the user experience. However, the overall landscape change is not considered significant, considering the underlying context of an urban and agricultural landscape which undergoes change over time.

Where the river diversion crosses Richmond Road in the north and Church Avenue in the south, the removal of existing vegetation of trees, hedgerows and ornamental planting will result in landscape change to the areas concerned. The open channel between these two areas will involve the removal of existing trees and hedgerows in the landscape. While the short term landscape impact is moderate to high and localised, replacement of this removed vegetation will greatly reduce landscape impact in the long term.

With a full diversion of the existing river channel taking place, the future use of the channel has been deemed outside the scope of this EIS, and a matter for Tipperary County Council.

## **12.5 Mitigation Measures**

### *12.5.1 North of Templemore*

**The proposed flood defence ramp, the flood defence embankments and the ramp within the flood embankment, and increasing the height of walls adjacent to ramp in road. The construction of weir, grass spillway and transition channel.**

- Design ramps with gradual slopes and appropriate materials in order to minimise visual impact.

- Use materials, pointings and finish to match the existing walls.
- The flood defence embankments should be rounded off at the top with a shallow grade and softened with a seed mix to match the existing groundcover vegetation/grass.
- The footprint for the embankment within the park should be designed to protect existing mature trees.
- Avoid the removal of mature trees during construction – protect trees being retained.
- Where removal of trees during construction is necessary they should be replaced with like size and type plants.
- Provide new native planting in the vicinity of the weir where existing planting will be removed during construction.

#### *12.5.2 Bypass Diversion through Town*

- Potential visual impact can be minimised by removing the least amount of existing vegetation possible, and by protecting any adjacent vegetation during construction.
- Route of diversion should follow any existing field boundaries in order to minimise any severance of land/properties.
- Where removal of vegetation cannot be avoided, it should be replaced where possible in the same location or nearby, and to the same size, on completion of construction works.
- Materials used in reinstatement of roads, pathways, and walls should be consistent with existing surfaces and materials.
- Construction work to be carried out speedily to minimise the impact on road users.

#### *12.5.3 South of Templemore Town*

##### **The proposed flood defence embankments and flood defence walls.**

- Where removal of vegetation cannot be avoided it should be replaced in approximately the same location with like size and type plants.
- All flood defence embankments should be rounded off at the top with a shallow grade and grassed.
- Stonework on new walls to be consistent with the stone already evident in the river walls.
- Materials used in reinstatement of roads, pathways, and walls should be consistent with existing surfaces and materials.

##### **The junction of the diversion channel, deposition area, erosion protection, widening of the channel and flood embankment.**

- The flood defence embankments should be rounded off at the top with a shallow grade and softened with grass.
- Replacement of any planting removed during construction.



**Flood defence embankment adjacent to Railway View.**

- The flood defence embankments should be rounded off at the top, with shallow grade and softened with grass.
- Replacement of any planting removed during construction.

***12.5.4 Residual Impact***

On completion of all mitigation measures, the impacts of the development should be significantly reduced. The shaping and softening of all embankments within the scheme will help to reduce negative visual impact and help tie them into the existing landscape. The use of seed mixes to tie in with existing local vegetation will play an important role in this outcome.

The use of appropriate materials in all wall, road, pathway building which are in keeping with existing local materials and finishes is critical in minimising landscape and visual impact. Areas of particular importance are river walls, walls, and footpaths. Considering material finishes in this way, will ensure that all introduced structures are as integrated and as sympathetic to the town fabric as possible.

Where vegetation is removed during the construction process, ensuring that it is replaced with similar size and type of vegetation will contribute to the reduction of potential negative visual impacts caused by the proposals. The introduction of new native planting at the weir, to the north of the town, will help to soften the proposed structure. At construction stage, efforts to minimise the removal of existing plant material will reduce impacts of the development within the existing environment.

Following successful implementation of mitigation measures, the key residual visual impacts under both scenarios will be:

**Scenario A – Existing river remaining, with the new channel taking only flood flows**

- Slightly raised road level and walls on Blackcastle Road, at Shortt's Bridge.
- Low embankments in Shortt's Field, rounded at the top and grass planted.
- Low embankment in the Town Park, with access path provided. Embankment will be rounded at the top, and grass planted.
- Low walls on embankment at the inlet to flood diversion. Stone work to match existing field walls.
- The channel route will be visible at both Richmond Road, and Church Avenue. Low walls adjacent to properties will be finished with stone in keeping with the character of Templemore. Barrier protection between the roadway and open channel will be visible here.
- Low embankment to the rear of properties at Railway View. Embankment will be rounded at the top, and grass planted.

- Low embankment at properties upstream of Small's Bridge. Embankment will be rounded at the top, and grass planted.
- Flood defence walls to protect properties downstream of Shortt's Bridge.

#### Scenario B – Existing river fully diverted to new channel

- Slightly raised road level and walls on Blackcastle Road, at Shortt's Bridge.
- Low embankments in Shortt's Field, rounded at the top and grass planted.
- Low embankment in the Town Park, with access path provided. Embankment will be rounded at the top, and grass planted.
- Low walls on embankment at the inlet to flood diversion. Stone work to match existing field walls.
- The channel route will be visible at both Richmond Road, and Church Avenue. Low walls adjacent to properties will be finished with stone in keeping with the character of Templemore.
- Low embankment to the rear of properties at Railway View. Embankment will be rounded at the top, and grass planted.

Following successful implementation of mitigation measures, the key residual landscape impacts will be:

- A slightly altered landscape approach to Templemore along Blackcastle Road, with the insertion of road ramp and views of embankments and raised walls.
- Open views of the channel route will change the experience on Richmond Road. The current streetscape will be altered with the removal of vegetation and buildings.
- Open views of the channel route will be experienced on Church Avenue. The removal of mature vegetation will cause short term landscape change.
- The removal of mature vegetation at different points around the town will have short term landscape impacts until they have been replaced and had time to grow.

## 12.6 Conclusions

The above sections examine the landscape and visual aspects concerned with the proposed flood relief scheme option (Viable Option 4) for Templemore, County Tipperary. Within this, the potential visual impacts of the various aspects of the scheme were identified, together with the potential impact on the existing landscape fabric and character. Upon completing the assessment of visual impacts, mitigation measures have been suggested in order to reduce the visual impact of the proposal, and also enhance the finished appearance of the scheme. Limitations to this assessment have been identified. If all mitigation measures are successfully carried out the overall change to the visual character and landscape of the study area will be slight to moderate.

## 13 MATERIAL ASSETS / TRAFFIC

### 13.1 Introduction

This EIS chapter aims to identify and classify any potential impacts upon the traffic and transportation in the town of Templemore by the proposed flood defence scheme.

#### 13.1.1 Study Methodology

##### **Consultation**

A meeting was held between OPW and the National Roads Authority (NRA) on 30<sup>th</sup> October 2008 to discuss design points raised in consultation responses regarding the scheme. The NRA informed the OPW that they have no major issues with the proposed plan and reiterated that the two issues that need be addressed are 1) form of construction of the culvert under the N62; and 2) the inspection regime. OPW stated that they would clarify how often they plan to carry out inspections.

Further consultation was undertaken with the NRA in June 2014 in which the following was recommended:

- The NRA recommended that further consultation be undertaken at an early stage by the Developer;
- The Developer shall consult with the relevant Local Authority / Regional Design Office in relation to impacts on the existing National roads and to identify the methods / techniques proposed for any works traversing / in proximity to, the national road, in particular any works that might affect existing structures on the national road;
- The Developer is required to meet the requirements of all relevant legislation and guidelines;
- The Developer shall determine if a Traffic & Transportation and a Road Safety Audit are required; and
- In addition, consultation shall also be undertaken with the Bridge Management Section of the NRA and Technical Acceptance requirements agreed, in accordance with the procedural requirements of NRA BD 2 – Technical Approval of Road Structures on Motorways and Other National Roads for structures.

Further consultation was also undertaken with the Local Authority on 7<sup>th</sup> July 2014, in relation to future road schemes within the vicinity of the scheme, it has been confirmed that no road schemes are proposed. TOBIN Consulting engineers also consulted with the National Roads Authorities Regional Project who confirmed there are committed road schemes in the area to be considered.

##### **Assessment**

Using the description of the project in Chapter 2 of this EIS, potential impacts on traffic and transportation have been identified and rated. The potential impacts are evaluated using the EPA

Guidance Document “Guidelines on the information to be contained in Environmental Impact Statements” published in March 2002 based on:

- Magnitude and intensity;
- Integrity;
- Duration; and
- Probability.

## 13.2 Existing Environment

The town of Templemore is situated on the N62 National route which joins Athlone with Thurles and is the centre point on the N62 linking the M7 (Dublin to Limerick) with the M8 (Dublin to Cork). The main traffic route through the town is along the Main Street onto George Street, crossing over Mall River and onto Richmond Road. A number of smaller roads lead off these major roads to provide access to local residential areas such as The Mall.

### 13.2.1 Proposed Works

The proposed diversion channel crosses underneath two roads within the town, the first crossing passes under the N62 Richmond Road between Richmond Grove and The Mall, the second crossing is located on the local road, Church Avenue.

Two embankments are proposed as a flood defence line north of the town to shut off the floodplain flow:

- 1) West of Blackcastle Road at Shortt’s Field; and
- 2) East of Blackcastle Road to the south east of the lake in the Town Park.

These embankments will be approximately 1.5m high at most. A ramp is also to be constructed on Blackcastle Road. The creation of the ramp requires the removal and rebuilding of roadside boundary walls; about 43m alongside Shortt’s Field and approximately 66m on the riverside. These new walls may require the provision of a safety barrier (to be determined at detailed design). Access ramps are to be provided at a grade of 1 in 20 over the embankment along the existing footpaths at the back of the park. An additional two downstream embankments are to be constructed at Smalls Bridge and Railway View Estate.

## 13.3 Potential Impacts

Two flood relief scheme scenarios were considered in this assessment:

- A. The river will be left in its current channel route, with the new channel taking only flood flows; and

- B. The river is diverted in full to the new channel.

It should be noted that the potential impacts are similar in both scenarios and they are therefore assessed together below.

The potential impacts on traffic and transportation can be grouped under the following headings.

#### *13.3.1 Deliveries to and from the site*

There will be deliveries to and from site throughout the estimated twelve month duration of works which will include concrete, structural reinforcement, materials for temporary road construction, road surfacing materials and precast culvert units. The most substantial element of work will be the removal of soil from the riverbed and banks between months 2 and 12 of the construction phase. It has been estimated that a total of up to 20,586m<sup>3</sup> of material will be excavated for construction of the diversion with approximately 3,652m<sup>3</sup> being reused as backfill material in the existing channel. A further 5,053m<sup>3</sup> of the excavated material will be used for the construction of embankments and 5,989m<sup>3</sup> will be used in deposit areas if possible, therefore the remaining 5,892m<sup>3</sup> will be transported off site.

Removal of excavated material offsite to permitted licensed disposal sites equates to, on average, three truck loads removed daily assuming a 10m<sup>3</sup> capacity heavy goods vehicle (HGV) over ten months (200 working days) of the construction period. The reuse of the excavated materials is to be confined within the site confines, with the exception of the construction of the Townpark Embankment. During the one month construction of the Townpark Embankment, three truck movements daily will haul material from the temporary storage stockpile to the embankment location along a short length of public road.

Assuming that culvert sections would be delivered on a 12m flatbed HGV in standard 2m lengths, and this would create 17 HGV movements to the site. In-situ concrete deliveries at 10m<sup>3</sup> per load would account for 35 ready mix lorry deliveries to and from the site. It has been estimated that 882m<sup>3</sup> of stone aggregate for the access road / four meter wide maintenance strip will be required, creating 89 truck movements to and from the site in the first month of construction.

The peak HGV movements during the construction programme correlate to the month during the construction of the Townpark Embankment, ongoing excavation of the channel and ongoing material deliveries (i.e. culvert, concrete, etc). The daily peak is 16 HGVs movements accessing and departing the site via the public road. The remaining construction months have an average of 10 movements each, with five arrivals and five departures daily.

The deliveries to and from site will have a slight negative impact upon the local traffic and transportation system as a number of additional vehicles will be using the road network within the town of

Templemore. The HGVs which will be delivering goods and materials to and from site will slightly increase noise and vibration levels as well as reducing air quality for a very short term in the locality of the works. This will be a short to medium term impact for the duration of the works which is expected to be in the region of 12 months.

The Annual Average Daily Traffic (AADT) on the N62 was calculated from the National Roads Authority (NRA) *'Live' Traffic Data Site (June 2014)*. Two traffic count data sets were averaged at the following locations:

- NRA1621 - N62 between Thurles and M8 Jn6 Thurles, Knockroe County Tipperary; and
- NRA1622 - N62 between Thurles and Templemore, Whitefield, County Tipperary.

The AADT on the N62 is 5737 with a 5.5% HGV, the relatively small number of vehicles travelling to and from the works during the peak month of construction increases the current volume of traffic on the road network by 0.6% AADT resulting in a slight negative impact.

When completed, the proposed scheme will not impact upon the current traffic and transportation routes within the town.

#### 13.3.2 Road closures to facilitate works

The construction of the culvert at N62 (Richmond Road) and Church Avenue will require lane closures to facilitate the installation of the culvert units over half road widths to facilitate traffic movement. It is not envisaged that any road closures will be required as part of the construction works to install the culvert units. However, a temporary traffic diversion along The Mall, Church Avenue and Manna South can be put into operation should a road closure be required. Any road closures will be of a temporary nature and will have a slight negative impact on traffic and transportation.

#### 13.3.3 Construction of road ramps

The construction of the ramp on the Blackcastle Road will require road closures. A temporary traffic diversion will be put into operation for the duration of the road closure. These road closures will be of a temporary nature and will have a slight negative impact on traffic and transportation.

### 13.4 Mitigation Measures

All possible measures will be undertaken to minimise the impacts upon the local traffic and transportation networks. The NRA's previous comments in 2008 regarding design and inspection will be investigated and incorporated into the final design and further consultation will be undertaken at appropriate stages following correspondences in June of 2014. The deliveries to and from site will be undertaken to a programme agreed with the Contractor prior to works commencing to minimise disruption to the roads network particularly during times of peak traffic flow. The Design Team /



Contractor will liaise with relevant local authority, NRA and residents groups and advance notice will be given to the general public through local media before any road closures take place. All possible service diversions should take place in advance of road closure for construction of the culvert.

Following consultation undertaken with the Local Authority on 7<sup>th</sup> July 2014, in relation to future road schemes within the vicinity of the scheme, it has been confirmed that no road schemes are proposed. TOBIN Consulting engineers also consulted with the National Roads Authorities Regional Project Office (15<sup>th</sup> July 2014) and it was confirmed there are no committed road schemes in the area.

Advance warning signs will highlight the presence of the new road ramp. The advance warning signs will be designed in accordance with Chapter 8, *Temporary Traffic Measures and Signs for Roadworks*, of the Traffic Signs Manual.

#### *13.4.1 Residual Impacts*

The mitigation measures outlined above will minimise the potential impacts upon traffic flow. The potential impacts as described in Section 13.3 will remain during the construction period, but they will be minimised. Due to the vertical elevation of the proposed road ramp on Blackcastle Road there will be permanent impacts to the flow rate of traffic at this location.

#### **The Do Nothing Scenario**

The 'do nothing scenario' (where no construction takes place) will have no impact upon traffic and transportation.

#### **The Worst Case Scenario**

The worst case scenario would involve delays to the works leading to the road closures and diversions being in place for a longer duration. It is envisaged that this risk will be minimised through appropriate planning and programming by the Contractor but there is always the potential for unforeseen circumstances delaying the works.

#### **Positive Impacts**

There will be no positive impact on traffic and transportation during construction but there will be a positive impact following completion of the development. The positive impacts of the development on traffic and transportation centre on the fact that the risk of flooding to roads and other infrastructure in the town will be greatly reduced following construction of the flood relief scheme.

#### **Reinstatement**

The road closures and diversions required for construction of the culvert will remain in place for the minimum duration. Upon completion, the roads will be immediately reopened and the diversions will no

longer be necessary. Any trenches or excavations required on the road network will be reinstated upon completion of the works.

### **Monitoring**

Continuous monitoring will be required to ensure that the Traffic Management Plan proposed by the Contractor does not result in unnecessary delays to traffic using the surrounding road network. This will be done by visual inspection of traffic queues during peak times and then an adjustment of the plan if required.

## **13.5 CONCLUSIONS**

In terms of material assets and traffic the potential impacts are the same for Scenarios A and B as mentioned above for the proposed flood relief scheme (Viable Option 4). All possible measures will be undertaken to minimise the impacts upon the local traffic and transportation during construction of the flood relief scheme. When completed, the proposed scheme will not impact upon the current traffic and transportation routes within the town.

## 14 CULTURAL HERITAGE

### 14.1 Introduction

Moore Group was commissioned to carry out an archaeological assessment for TOBIN Consulting Engineers for a proposed flood relief scheme in Templemore, County Tipperary (Viable Option 4). The principal study area centres on the Mall River, which runs approximately northwest to southeast through the town and has been the source of previous flooding and housing damage in the past. The main impact issues to be dealt with regarding the proposed scheme may be divided into two sections; terrestrial and riverine. The terrestrial impact refers to works centred on what are now green field sites, namely the creation of a number of embankments, a new culvert and spillway channel, while the riverine impact deals with three areas where the proposed scheme will impact on the Mall River, its banks and adjacent land. It will include the channel, floodplain, and immediate surrounding areas of the Mall River extending along the main channel upstream and downstream of Templemore.

#### 14.1.1 Scheme History

This scheme was initially the subject of a constraints report carried out in 2004 which assessed the Cultural Heritage Resource in the wider subject area (Halpin & Dippie, 2004). This study was subsequently followed by an EIS in January 2009 which included an underwater survey. The significant sites identified at this stage did not include any recorded monuments, protected structures or sites that feature on the National Inventory of Architectural Heritage.

#### 14.1.2 Proposed Works

The proposed scheme involves:

- A 60m-long inlet channel with Debris and Gravel Traps and a small Drop Weir.
- A new outflow from the lake to run under Blackcastle Road to the inlet channel.
- A flood-defence line north of the town, in-line with a culvert over the new diversion.
- Relocating the river by constructing a new 805m long channel (with a 7.5m base width) that begins in Short's field and finishes approximately 230m downstream of Small's Bridge.
- Road and access bridges will need to pass the full Climate Change flow of 21.63 m<sup>3</sup>/s.
- As the bypassed stretch of the river is no longer required, there are no residual flood risks from wall failure, etc. and no need to sluice its drainage outlets.
- At Richmond Road and Church Avenue, separated by 8.4m, walls along both banks of the diversion both up and downstream.
- An embankment on the left bank (east side) below properties at Small's Bridge.

- Re-grading 480m of the channel from the new confluence to 740m below Small's Bridge. Over the same reach, widening the river to 7.5m and a further 250m from there to transition back to the existing 4.5m base width.
- Defence embankment in the Railway View Estate area.
- To improve aeration and fish movement along the excavated river and diversion, a 'Fish Channel' will be dug and partially backfilled with gravels. While this will likely be about 0.3m deep with a 2m wide bed and up to 5 to 1 side slopes, it will be designed and constructed in consultation with the region's Fishery Board and, along the channel, may be higher or lower and its width may vary.
- Future growth of woody vegetation in the area downstream of the town must not encroach upon the river or damage the flowing floodplain. The channel from the upstream works to where the Mall discharges to the Suir is being designated for maintenance.
- Impacts to the landscape will be reduced by using high quality finishes to works, grassed finishes to embankments and open channel sections, and by planting replacement and new vegetation; including in-channel, where possible.

For a detailed description of the proposed works please see Chapter 2.

Moore Group is a multi-disciplinary environmental, planning and heritage resource management consultancy. Our work includes Environmental Impact Assessments (EIS), surveys of terrestrial, freshwater and marine environments, conservation management planning, ecological landscape design, built heritage and archaeological consultancy and fieldwork including archaeological excavation and other specialist services.

For the purposes of this report the definition of “cultural heritage” is taken broadly from the UNESCO Convention Concerning the Protection of the World Cultural and Natural Heritage, 1972, which considers the following to be “cultural heritage”:

- Monuments: architectural works, works of monumental sculpture and painting, elements or structures of an archaeological nature, inscriptions, cave dwellings and combinations of features, which are of outstanding universal value from the point of view of history, art or science;
- Groups of Buildings: groups of separate or connected buildings which, because of their architecture, their homogeneity or their place in the landscape, are of outstanding universal value from the point of view of history, art or science; and
- Sites: works of man or the combined works of nature and man, and areas including archaeological sites which are of outstanding universal value from the historical, aesthetic, ethnological or anthropological point of view.

The principle aim of the Cultural Heritage Assessment is to anticipate and avoid impacts on the cultural heritage resource. Detailed constraints mapping forms the basis of this work, followed by further analysis of sites that will potentially be impacted upon and field surveys to ground truth the results of the desk based assessment work and ascertain the significance of any potential impacts.

This assessment of the proposed scheme in relation to archaeological, architectural and cultural heritage was based on a desktop study of published and unpublished documentary and cartographic sources, followed by field survey. In light of the legislative protection afforded to the cultural heritage resource this report assesses the archaeological, architectural, cultural and historical importance of the subject area and examines both the potential direct and indirect effects the proposed scheme may have on the receiving environment.

This report, together with supporting GIS data, details the recorded cultural heritage resource within the defined study area of the project. This study was undertaken to assist the project designers in appreciating the legal framework and the levels of protection afforded to the archaeological, architectural and cultural heritage resource in an international, national and regional context. In 2002, the Government published the National Heritage Plan which set out strategies for the conservation and management of our heritage. A key element of both plans is an enhanced role for local authorities in heritage awareness and management, to be given effect through the preparation and implementation of County Heritage Plans. As part of this study all relevant documentation including the relevant county, town and local development plans as well as heritage plans were reviewed.

## 14.2 Conventions and Legislation

Ireland has ratified several European and international conventions in relation to the protection of its cultural heritage. Outlined herein are pertinent summaries of relevant conventions and legislation.

### *14.2.1 Planning and Development (Strategic Infrastructure) Act 2006 – 2009*

The Planning and Development (Strategic Infrastructure) Act 2006 ensures the protection of the archaeological heritage resource by requiring that all applications under this Act are accompanied by an EIS including information on material assets, including the architectural and archaeological heritage, and the cultural heritage.

### *14.2.2 The National Monuments Act 1930 to 2004*

Irish legislation for the protection of archaeological heritage is based on the National Monuments Acts 1930 and amendments of 1954, 1987, 1994 and 2004. These acts are the principal statutes governing the care of monuments in the Irish Republic. They provide for the protection of national monuments through the use of preservation orders. The Minister for the Environment, Heritage and Local Government has a specific role in relation to the protection of the archaeological heritage through

powers provided by these acts and the National Cultural Institutions Act 1997. The overall state archaeological service is provided by the Department of Arts, Heritage and the Gaeltacht (DAHG) and delivered through the Planning and Heritage Section of the DAHG and the National Museum of Ireland (Irish Antiquities Division) on behalf of the Minister.

Monuments are protected under the National Monuments Acts in a number of ways:

- National Monuments in the ownership or guardianship of the Minister or a local authority. A National Monument is a monument under preservation by the State, as a result of its being considered to be of national importance. The legal basis for this status is the National Monuments Acts 1930 to 2004. The original national monuments Act was enacted in 1930 updating an original inventory of monuments comprised of those to which the Ancient Monuments Protection Act, 1882 applied. The most recent amendment in 2004 includes provisions for the partial or complete destruction of National Monuments by the Government. Only a small section of our monuments are in state ownership. The remainder are protected by the state under the National Monuments Acts but the care and preservation of these features depends largely on the interests and respect of individuals.
- National Monuments, which are subject to a preservation order; where it appears to the Minister that a monument, considered to be a national monument, is in danger or is actually being destroyed or falling into decay the Minister may, by preservation order or temporary preservation order, undertake the preservation of the monument. A temporary preservation order will remain in force for six months and then expire.
- Historic monuments or archaeological areas recorded in the Register of Historic Monuments; contains a list of all historic monuments known to the Minister. Owners or occupiers must not, other than with consent, alter, deface, demolish or in any manner interfere with a historic monument entered in the register (National Monuments (Amendment) Act, 1987).
- Monuments recorded in the Record of Monuments and Places (RMP). All known sites and monuments are identified and listed for protection in the Record of Monuments and Places, a statutory inventory of sites protected under the National Monuments (Amendment) Act, 1994. Monuments entered into it are referred to as Recorded Monuments. Owners or occupiers of Recorded Monuments are required to give two month's notice to the Minister and obtain consent before carrying out any works in relation to the monument. This is to allow the National Monuments Service time to consider the proposed works and how best to proceed to further the protection of the monument. For national monuments in the ownership or guardianship of the Minister or a local authority or which are subject to a preservation order, the prior written consent of the Minister is required for any works at or in proximity to the monument. The RMP consists of a set of 6" maps of the different counties with an accompanying index which shows all the sites, monuments and zones of archaeological potential, recorded to date and protected in the county. The inventory concentrates on pre 1700 AD sites.



#### *14.2.3 ICOMOS Declaration*

Ireland is a signatory to an international declaration sponsored by ICOMOS (International Council on Monuments and Sites) Xi'an Declaration on the Conservation of the Setting of Heritage Structures, Sites and Areas, 2005 which endeavours to ensure the safeguard and conservation of the World's cultural heritage as part of its sustainable and human development.

#### *14.2.4 EIA Directive 85/337/EEC as amended*

In order to assist planning and other consent authorities in deciding if significant effects on the environment are likely to arise in the case of development below the national mandatory EIS thresholds, the Minister for the Environment, Heritage and Local Government published a Guidance document in August 2003.

#### *14.2.5 The European Landscape Convention 2000*

In 2002 Ireland ratified the European Landscape Convention - also known as the Florence Convention, which promotes the protection, management and planning of European landscapes and organises European co-operation on landscape issues. It is the first international treaty to be exclusively concerned with all dimensions of European landscape. The Convention came into force on 1 March 2004 and is part of the Council of Europe's work on natural and cultural heritage, spatial planning and the environment. It applies to the entire territory of the ratified parties and relates to natural, urban and suburban areas, whether on land, water or sea. It therefore concerns not just remarkable landscapes but also ordinary everyday landscapes. The European Landscape Convention introduces the concept of "landscape quality objectives" into the protection, management and planning of geographical areas.

#### *14.2.6 The Planning and Development Act 2000*

Under arrangements which came into operation on 1<sup>st</sup> January 2000 (The Planning and Development Act 2000), the system of listing buildings was replaced with strengthened procedures for the preservation of protected structures and structures in architectural conservation areas (ACA).

A protected structure is a structure that a local authority considers to be of special interest from an architectural, historical, archaeological, artistic, cultural, scientific, social or technical point of view. Details of protected structures are entered by the authority in its Record of Protected Structures (RPS), which is part of the development plan. Each owner and occupier of a protected structure is legally obliged to ensure that the structure is preserved.

The legislation obligates planning authorities to preserve the character of places and townscapes which are of special architectural, historic, archaeological, artistic, cultural, scientific, social or technical interest or that contribute to the appreciation of protected structures, by designating them ACA in their development plan. The Act also provides comprehensive protection for landscapes including views,

prospects and the amenities of places and features of natural beauty or interest under a local authority's development plan. A development plan is required to include objectives for the preservation of the character of the landscape including the preservation of views and prospects. A planning authority may also designate, for the purposes of preservation, landscape conservation areas.

#### *14.2.7 The Architectural Heritage and Historic Properties Act, 1999*

The Architectural Heritage (National Inventory) and Historic Properties (Miscellaneous Provisions) Act, was promulgated in 1999 as a direct response to the Granada Convention (see below). The Act provides for the establishment of a national inventory of architectural heritage and for related matters and to provide for the obligations of local sanitary authorities in respect of registered historic monuments. Although this Act provides no direct protection for architectural sites, it is used by local authorities to inform the compilation of their Record of Protected Structures which, under the Planning and Development Act 2000, does afford legal protection.

#### *14.2.8 Valletta Convention*

In 1997 the Republic of Ireland ratified the Council of Europe European Convention on the Protection of the Archaeological Heritage (the 'Valletta Convention'). Obligations under the Convention include:

- provision for statutory protection measures, including the maintenance of an inventory of the archaeological heritage and the designation of protected monuments and areas;
- the authorisation and supervision of excavations and other archaeological activities;
- providing for the conservation and maintenance of the archaeological heritage (preferably in situ) and providing appropriate storage places for remains removed from their original locations;
- providing for consultation between archaeologists and planners in relation to the drawing up of Development Plans and development schemes so as to ensure that full consideration is given to archaeological requirement, making or updating surveys, inventories and maps of archaeological sites and taking practical measures to ensure the drafting, following archaeological operations, of a publishable scientific record before the publication of comprehensive studies; and
- preventing the illicit circulation of elements of the archaeological heritage, including co-operation with other states party to the convention.

#### *14.2.9 Granada Convention*

Also in 1997 the Republic of Ireland ratified the Council of Europe Convention on the Protection of the Architectural Heritage of Europe (the 'Granada Convention'). Obligations under this convention include maintenance of inventories of architectural heritage, provision of statutory measures to protect the architectural heritage, the adoption of integrated conservation policies, which include the protection of

the architectural heritage as an essential town and country planning objective, developing public awareness of the value of conserving architectural heritage etc.

#### *14.2.10 UNESCO World Heritage Convention, 1972*

In an international context Ireland is a ratified member of The World Heritage Convention, adopted by UNESCO in 1972. The Convention provides for the identification, conservation and preservation of cultural and natural sites of outstanding universal value for inclusion in a world heritage list. The World Heritage status is a non-statutory designation and no additional statutory controls result from this designation. However the impact of proposed scheme upon a World Heritage Site will be a key material consideration in determining planning applications.

#### *14.2.11 County and Local Area Development Plans*

The North Tipperary County Development Plan 2010-2016 and the Templemore Town Development Plan (Draft 2012-2018) and relevant strategic documents guiding the Councils overall strategy for the proper planning and sustainable development of their administrative area were consulted. These plans were prepared in accordance with the Planning and Development Acts, 2000-2010 and with the requirements for Local Area Plans contained within the Planning and Development (Amendment) Act 2002. The purpose of the Plans are to inform the general public, the statutory authorities, developers and other interested bodies of the policy framework and broad land use proposals that will be used to guide development throughout the administrative area. There are numerous sites of archaeological interest in and surrounding the town including the castle and the bridge.

#### *14.2.12 Desk Based Study*

World Heritage Sites and Candidate World Heritage Sites were reviewed to see if any are located within the vicinity of the proposed scheme.

All known cultural heritage sites were mapped in GIS along with high resolution aerial photography and Ordnance Survey Ireland (OSI) First Edition Mapping (Circa 1830). Sites mapped included the following:

- National Monuments, a now out of date data set previously available from [www.heritagedata.ie](http://www.heritagedata.ie);
- Record of Monuments & Places (RMP) from [www.archaeology.ie](http://www.archaeology.ie);
- Records of Protected Structures from Tipperary County Council;
- National Inventory of Architectural Heritage (NIAH) for County Tipperary; and
- Demesnes Landscapes and Historic Gardens indicated on the OSI First Edition Mapping.

All townlands located within 0.5km of the proposed scheme were listed and cross referenced with:

- National Monuments List for County Tipperary from [www.archaeology.ie](http://www.archaeology.ie); and
- Preservation Orders, a list compiled by the Department of Environment Heritage & Local Government (DoEHLG).

All churches and graveyards which have the potential to be in the ownership of the Local Authorities were highlighted as potential National Monuments.

The County Development Plan for Tipperary was reviewed and several other documentary and literary sources were reviewed to ascertain a comprehensive understanding of the cultural heritage of the region.

Based upon all the information reviewed all sites were mapped in GIS and significant sites were highlighted for the further analysis during the field survey.

#### *14.2.13 Information Sources*

The following information sources were used for this report:

- National Monuments Lists from the DoEHLG;
- Sites subject to Preservation Orders from DoEHLG;
- Record of Monuments & Places database from [www.archaeology.ie](http://www.archaeology.ie);
- Record of Protected Structures shapefiles from Tipperary County Council;
- National Inventory of Architectural Heritage shapefiles from [www.buildingsofireland.ie](http://www.buildingsofireland.ie);
- First Edition Maps (circa 1830) from Ordnance Survey Ireland; and
- Aerial photography.

Please refer to Volume 3, Appendix 14-1 for a bibliography and a list of other sources referenced.

### **14.3 Existing Environment**

#### *14.3.1 Locational Details*

The proposed project, running north to south, extends from a point in Manna North townland to the north west of Templemore. The diversion channel will follow a course running to the west of Blackcastle Road, bypassing Abbey Cottage. It continues into Bellville townland through Shortt's Field and crosses the N62 near Hassett's garage workshop into Manna South. Passing through a green field to the east of the Garda Training College the route passes under Talavera Place before re-joining the river to the south of Small's Bridge.

County	Tipperary
Barony(s)	Eliogarty
Civil Parish	Templemore
Townland(s)	Templemore Demense, Belleville, Manna South, Killtilane, Woodville, Kylebeg
OS Sheet number(s)	TN029
RMP No.s	Various including the Historic town TN029-062
NGR	Centred on 610920/671606

### 14.3.2 Archaeological, Architectural and Historical Background

Research was undertaken in two phases. It comprised of a desk-based study of all available archaeological, historical and cartographic sources and a site walkover.

#### **Templemore Local History**

The earliest site in the wider Templemore area (TN 029:022) is a boulder burial dating to the Bronze Age, a period of substantial population growth throughout the county. This is corroborated by evidence uncovered at Curraghatoor, Ballyveelish, and Longstone all of which indicate intensive habitation and growth throughout the mid- and late-Bronze Age period. The boulder burial is located within a field in pasture with views of the Devils Bit Mountain to the north- northwest. These sites are sometimes associated with earlier monuments or can be associated with areas of copper mining as in Cork and Kerry.

There are two recorded monuments (TN 029:2301 & TN 029:2302) of unknown date located in the southeast corner of Lloydsborough townland to the south of the river course and partially within the flooding zone. These consist of two mounds which may represent natural features.

As with the rest of the country, evidence of Iron Age occupation is relatively limited, which suggests, as yet, an unexplained decrease in the country's population during this time. This is further supported by scientific evidence that has been recovered from pollen samples, like those taken from the Littleton bog, which clearly demonstrates a decline in agricultural activity and the regeneration of forest-cover. What evidence there is for Iron Age activity is almost exclusively confined to the northern third of the county. Hilltop enclosures and hillforts, monuments thought to date from the late Bronze Age/Iron Age period are found here, namely the county's three hillforts at Garrangrena, Ballincurra and Ballyanny Lower. There are a number of enclosure sites and a ringfort in the immediate vicinity of Templemore Town (RMP No. TN 029:041, TN 029:043, TN 029:044, TN 029:052 and TN 029:074). Previously there was another ringfort located within Templemore Town (RMP No. TN 029:088) however this site has been destroyed.

Templemore, known as Corkatenny until the 16th century, was granted to Thomas de Hereford by Theobald Walter in 1206 (Farrelly & O'Brien 2002, 336).

There are eight recorded monuments located within Templemore Demesne. These consist of the historic town (TN 029:062), a medieval church, graveyard and associated graveslabs (TN 029:062001, 062005, 062006 & 062007). A castle, bawn (TN 029:062002 & 062004) and house (TN 029:06303) make up a separate complex.

The church (TN 029:062001) is located on the eastern side of the artificially made Templemore lake and is thought to date to the beginning of the 13th century when the abbey of St. Thomas of Dublin erected a large church and dedicated it to the Blessed Virgin Mary (Farrelly & Carey 1994, 69). It is Listed in the ecclesiastical taxation of the Diocese of Cashel in 1302 (CDI, vol. 5, 283) and remained in use until 1790 (Walsh 1991, 46). Within the church there are a number of loose architectural fragments, some of which have been inserted in a partially reconstructed window in the northwall. In the west section of the church there is a plain graveslab with an inscription in English around the edge, it reads: HERE LAYS THE BODY OF ISAAC HAIES OF KNOCRANROE WHO DYED THE 43 YEAR OF HIS AGE THE 15 OF APRIL 1703. It seems that Isaac Hales was a Cromwellian who had been granted land in Knockinroe (Walsh 1991, 46-7). There is a seventeenth-century tombstone in the northeast corner lying recumbent on an altar table. It is a tapering slab, decorated with an eight-arm floriated cross which rests on a stepped calvary mount with a skull and cross-bones. The border inscription in Latin is a mixture of Gothic and English capitals: ....JACET RD: PATER D: EDMUNDUS DULLANY RECTOR BEATA MARIA DE TAMPLEMORE ET PRIOR COMMENDATORIVS INSULAE....FIERI FECIT AI 1632: CUIUS AIA PROPITIE.... which translates as: [Here] lies Rev Father D Edmund Dullany, Rector of St Mary's of Templemore, and Prior in Commendam of the Island...who had (me) made in the year 1632: on whose soul may [the Lord] have mercy (Hayes 1993a, 186-8).

The castle (TN 029:062002) is located on the southwest edge of Templemore Demesne within the present townpark, and beside a minor roadway heading NNW out of the town. The river is located on the opposite side of the road.

The town of Templemore was originally known as Corkatenny until the sixteenth century, it was granted to Thomas de Hereford by Theobald Walter before his death in 1206. In a series of charters dating to the early thirteenth century de Hereford gave tithes and ecclesiastical benefices of all his lands, including 'Corcateny' to the Augustinian abbey of Saint Thomas in Dublin (Reg. St. Thomas, Dublin 194, 196, 237). This Order built a church (TN 029-062001) in the town probably early in the thirteenth century, though the first reference to it in the Abbey register dates to 1240 (Gilbert 1889, 315-16).

In the 13th century, Thomas de Hereford relinquished his claims on Templemore to William de Marisco. A Purcell Lord of Corketoni was noted in 1356 but the de Marisco family are associated with the area again in the later 16th century. The 'Black Castle' (TN 029:06202) of Templemore dates to this period (Farrelly & O'Brien 2002, 336).



There are a number of suggested builders of the castle (TN 029:062002). Locally there is a tradition that the Knights Templars occupied the castle and another that it was built by O'Meagher, chief of Ikerrin, while local historian Paul Walsh believes that the castle was built by the Butlers in 1450. By the mid 1650's the "castle and the walls of a stone house were out of repair" (The Civil Survey) however the castle was habitable again in 1698.

The name Templemore (TN 029:062) first appears in 1570, deriving its name from the big abbey church in the Town Park. It would appear that for some years following the reformation, this abbey was in use by Catholics, as a tomb in the adjoining graveyard records the burial of Father Edmundus Dulaney PP St Mary's Templemore in 1632. In 1684 the local Protestant Union was formed and the abbey was used until 1790 when it was in bad repair and vacated. The portion in use for service at that time can be seen through the entrance gate.

During the 17th century, Templemore passed through the hands of Purcell, Baron of Loughmoe and Walter Lawless. In the civil survey (1654-6) Templemore was described as 'the Mannour, Castle Towne, and lands of Templemore'. In 1698 John Carden leased 'the Manor Town, Castle and lands of Templemore and in 1704 Carden bought the freehold to the property. The Cardens lived in the castle until 1740, when it was destroyed by fire (Walsh 1991, 5 & Farrelly & O'Brien 2002, 336). The present town of Templemore was built as a market town in the latter half of the eighteenth century.

Today Templemore is typical of a late 18th and 19th century small market town in both in street pattern, streetscape and nature of use. Lewis in 1837, describes the town as "a market and post town...the town is clean well built and modern; it is approached by handsome avenues of Ash trees, and owes its very improved condition to the exertions of the late proprietor, Sir John Craven, Carden, Bart.... It contains an infantry barracks (the present Garda College)... and a hospital attached... a bridewell, a fever hospital and dispensary... and reading rooms, and a public billiard table. The neighbourhood is adorned with many fine seats and elegant cottages" (Lewis 1837, 609). These fine seats include Lloydsborough, seat of J. Lloyd, Esq.... Handsome residence in a well-planted demesne. Woodville lodge, residence of D.J. Webb, Esq. Belleville, residence of the Hon. C.J.K. Monck. The residence of the Cardens is described as being in the process of being newly built "on a more elegant spot" (Lewis 1837, 610).

### **Richmond Barracks**

The present day Garda Barracks was originally built in 1809 as Richmond Barracks after a Government decision to build a number of new Barracks in Ireland. The Peninsular War was in progress while the Barracks was being built, and to commemorate recent victories in that campaign, streets in Templemore were named after locations associated with the Peninsular War, such as Wellington Mall, Talavera Place, Vimerma Mall and Bussaco Street. The barracks was named in honour of the Duke of

Richmond, who served under the Duke of Wellington. Richmond Barracks was built on a 57 acre site owned by Sir John Carden, a member of the dominant local family. An unpopular figure, as he had evicted many tenants from his estates, thereby earning the nickname 'Woodcock' because 'those who shot at him always missed'. Richmond was one of the largest barracks in Ireland, and in 1837 it was reported that; 'Templemore contains extensive military barracks with accommodations for 54 officers, 1500 men and 30 horses, and an hospital for 80 patients; a bridewell; a fever hospital and a dispensary, ball, news and reading rooms, and a public billiard table.

The large proportion of Irish soldiers in the army and their loyalty to the crown was an ongoing cause of concern to the government. In 1886, W.H Smith, the secretary of state for war, proposed that the chief secretary should seek to improve the employment prospects for army reservists in Ireland and commented that 'They are probably disposed to be loyal, but it would be just as well to make it worth their while to remain so'.

Between September 1914 and March 1915, over 2,300 German Prisoners of War were interned in Richmond Barracks. Four huge cages complete with searchlights, barbed wire and sentry towers were built on the parade ground, and the prisoners of war were kept in these cages. In spring 1915 the British authorities decided to move all of the prisoners to England.

After the German prisoners had departed, Richmond became a large training depot for Irish recruits joining the British army, particularly the Royal Munster Fusiliers, the Leinster Regiment and the Royal Dublin Fusiliers. Thousands of Irishmen were trained in Templemore, and many did not return.

When World War II began in September 1939, a state of emergency was declared in Ireland, which remained neutral. McCan Barracks was occupied by the 10th Uisneach Battalion, and until the war ended in 1945 a very large garrison was stationed in Templemore. McCan Barracks was then vacated except for regular F.C.A (Reserve Defence Forces) camps during the 1950's, and when the F.C.A was integrated with the regular Army, McCan became the Headquarters of the 3rd Field Artillery Regiment. A new building was constructed recently within the walls of the Garda College for the regiment, thereby maintaining the long association between the military and Templemore.

In 1963 the Government decided to move Garda training from the Phoenix Park depot in Dublin where it had taken place since 1842 to McCann Barracks, which was renamed as the Garda Training Centre (GTC). *Note: The above was extracted from Templemore.ie*

### 14.3.3 Archaeological & Architectural Heritage

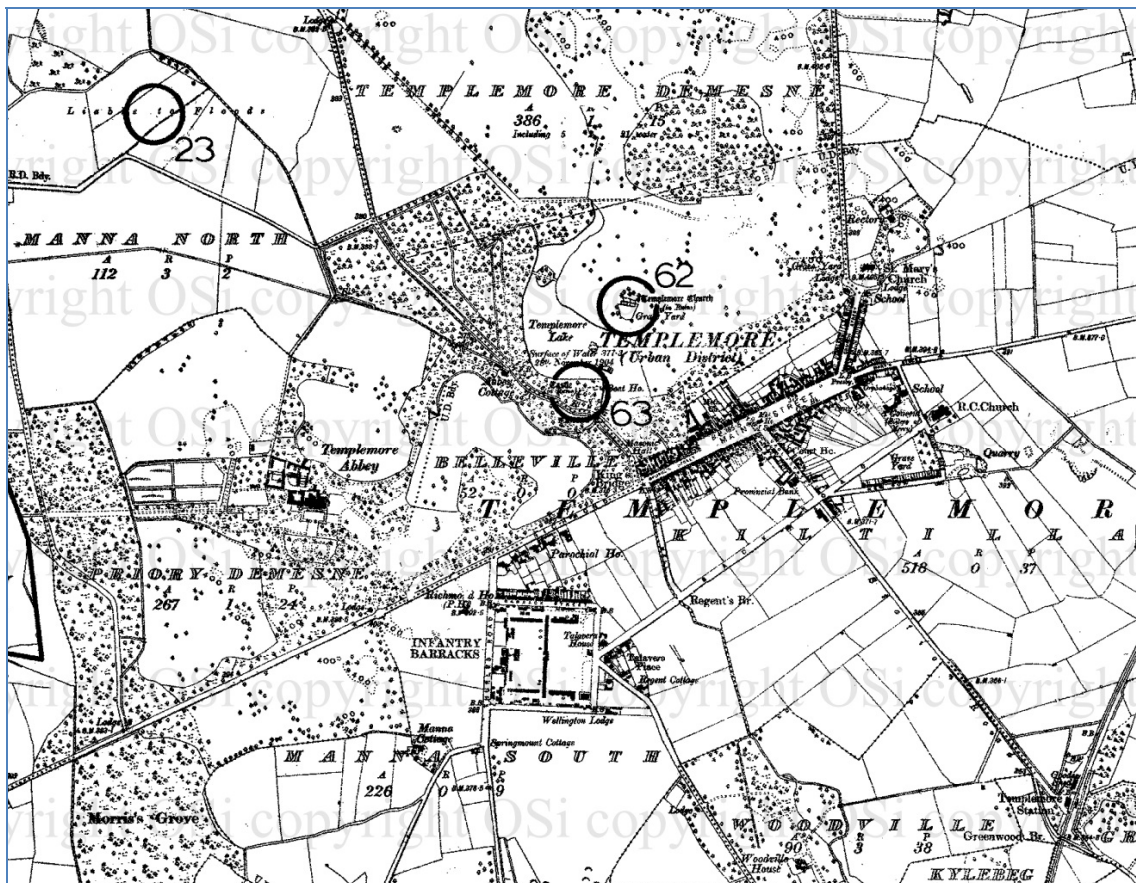
#### **National Monuments**

Under the National Monuments Act (1930) and its various amendments archaeological sites in the ownership or guardianship of the state or a local authority and sites under preservation orders are designated as National Monuments and offered the highest level of protection under Irish Legislation. There are no National Monuments in the vicinity of the proposed scheme.

#### **Sites and Monuments Record (SMR) / Record of Monuments and Places (RMP)**

A review of the Record of Monument and Places (RMP) dataset identified 12 sites situated within the Templemore Flood relief study area. Summary details are listed below:

**Figure 14-1 Extract from RMP sheet 029, Templemore**



**Table 14-1 Relevant RMP's in the vicinity of the subject area.**

SMR No	Class	Townland	ITM Reference (E,N)
TN029-023001-	Mound	LLOYDSBOROUGH (Killea Par.)	609658, 672510
TN029-023002-	Mound	LLOYDSBOROUGH (Killea Par.)	609688, 672540
TN029-024----	Designed landscape - tree-ring	TEMPLEMORE DEMESNE	610748, 672480
TN029-062001-	Church	TEMPLEMORE DEMESNE	610863, 672048
TN029-062002-	Castle - tower house	TEMPLEMORE DEMESNE	610737, 671811
TN029-062003-	House - indeterminate date	TEMPLEMORE DEMESNE	610742, 671819
TN029-088----	Redundant record	MANNA SOUTH	610378, 671290
TN029-062005-	Graveyard	TEMPLEMORE DEMESNE	610851, 672026
TN029-062----	Historic town	TEMPLEMORE DEMESNE	610907, 671925
TN029-062004-	Bawn	TEMPLEMORE DEMESNE	610749, 671808
TN029-062006-	Graveslab	TEMPLEMORE DEMESNE	610877, 672050
TN029-062007-	Graveslab	TEMPLEMORE DEMESNE	610874, 672046

**Record of Protected Structures (RPS/ National Inventory of Architectural Heritage (NIAH))**

The following structures are listed in the vicinity of the subject area. A full inventory of the record of Protected Structures for Templemore is available via the Templemore and Environs Development Plan 2012-2018.

**Table 14-2 List of Relevant RPS's in the vicinity of the subject area.**

No	Townland	Structure name	Description
S79	Barnane (Templemore)	Lodge (Barnane House)	Dormer-style cut stone house with cut stone chimneys. Protruding bay with parapet eaves and cross cut into/carved into stone.
S80	Barnane (Templemore)	Barnane House	Ruin of extensive house and outbuildings. Stone walls with castellation and cut stone arches remain. Stone tower with castellation.
S81	Barnane (Templemore)	Barnane Stud	Three bay, two storey house with dormer style, natural slate roof. Parapet eaves. Protruding single storey centre bay at front. Cut stone arch containing doorway and holding crest plate. Cross cut into/carved into stone. Remains of walled garden.
S82	Barnane (Templemore)		Dormer style, cut stone lodge house. L-shaped. Cut stone architrave over windows. Pitched slate roof with parapet eaves. Crest plate/date stone without inscription.
S83	Barnane (Templemore)		Cut stone cottages with cut stone chimneys. One refurbished.
S84	Barnane (Templemore)	Barnane School	Old School house, partially refurbished and used as residence.
S85	Barnane (Templemore)	Fairy Hill	Two storey house. Extensive stone outbuildings.
S206	Killea (Templemore)	St. James R.C. Church	Early barn style church - 1782 - 1832. Wet dashed with buttressed walls. Arched windows.
S220	Kiltillane	Templemore train station	Cut stone dormer style train station. Arched windows and doors. Redbrick chimney.
S313	Park (Templemore)		Five bay two storey house. First and fifth bay at greater height than centre bays. Rendered with quoins. Pitched slate roof. Stone tower to rear with castellations.
S312	Park (Templemore)	Killea School	Five bay, single storey school house. Dashed with pitched roof.
S374	Templemore'	Kill House	Mid 19th Century two storey house with small Georgian rear
S405	Woodville (Templemore)	Woodville House	Three bay, two storey house with hipped slate roof. Cut stone single storey pediment type protrusion on ground floor centre bay.
61	Lloydsborough	Lloyborough House	Three bay, two over basement house, four bay deep. Three bay addition to gable end (L-shaped). Hipped natural slate roof with valley. Large cut stone columns and canopy at ground floor centre bay. Rendered with quoins. Addition to gable end is faced in stone. Two single storey bowed windows at ground floor to rear. Each with flat roof and cut stone parapet walls. Stone outbuildings with cut stone arches and sills. Cast iron guttering and balcony. Estate walls approximately 3 miles long. House began life as hunting lodge in 1798.
S185	Greenwood	Bellwood House	Two storey house. Natural slate roof. Arched. Rendered. Timber windows.



**Table 14-3 List of Relevant NIAH's in the vicinity of the subject area.**

Reg No	Name, Classification & date	Townland	Coordinates)	Rating
22308001	Bridge, Templemore Park, 1800-1840	Templemore Demesne	210682, 172084	Regional
22308008	Abbey Lodge, Gate Lodge 1860-1870	Belleville	210619, 171797	Regional
22308050	The Mall, House, 1820-1860.	Kiltillane	210995, 171493	Regional
22308013	T. Morkan, Patrick Street, 1880-1920.	Kiltillane	210988, 171591	Regional
22308014	T. Kennedy, Patrick Street, 1880-1920.	Kiltillane	211046, 1716261	Regional
22308017	Bank of Ireland, Main Street, Templemore, Tipperary North	Kiltillane	211120, 171694	Regional
22308016	Main Street, Templemore, Tipperary North 1880-1840	Kiltillane	211116, 171685	Regional
22308018	Former Methodist Church, Main Street, Templemore, Tipperary North 1800-1840	Kiltillane	211115, 171726	Regional
22308030	E. J. Grey, Patrick Street, Templemore, Tipperary North 1840-1880	Kiltillane	211014, 171564	Regional
22308032	Tom Maher's Inn, Patrick Street, Templemore, Tipperary North 1800-1840	Kiltillane	211053, 171583	Regional
22308033	Jameson Racing, Patrick Street, Templemore, Tipperary North, 1890-1910.	Kiltillane	211061, 171585	Regional
22308034	Mockler's Pharmacy, Patrick Street, Templemore, Tipperary North	Kiltillane	211091, 171602	Regional

**NIAH Garden/Demesne Survey**

Demesnes, a word now particular to Ireland, date back to the Anglo-Normans, when they formed the portion of a manor retained by the lord for his own occupation and use. The great flourishing of garden



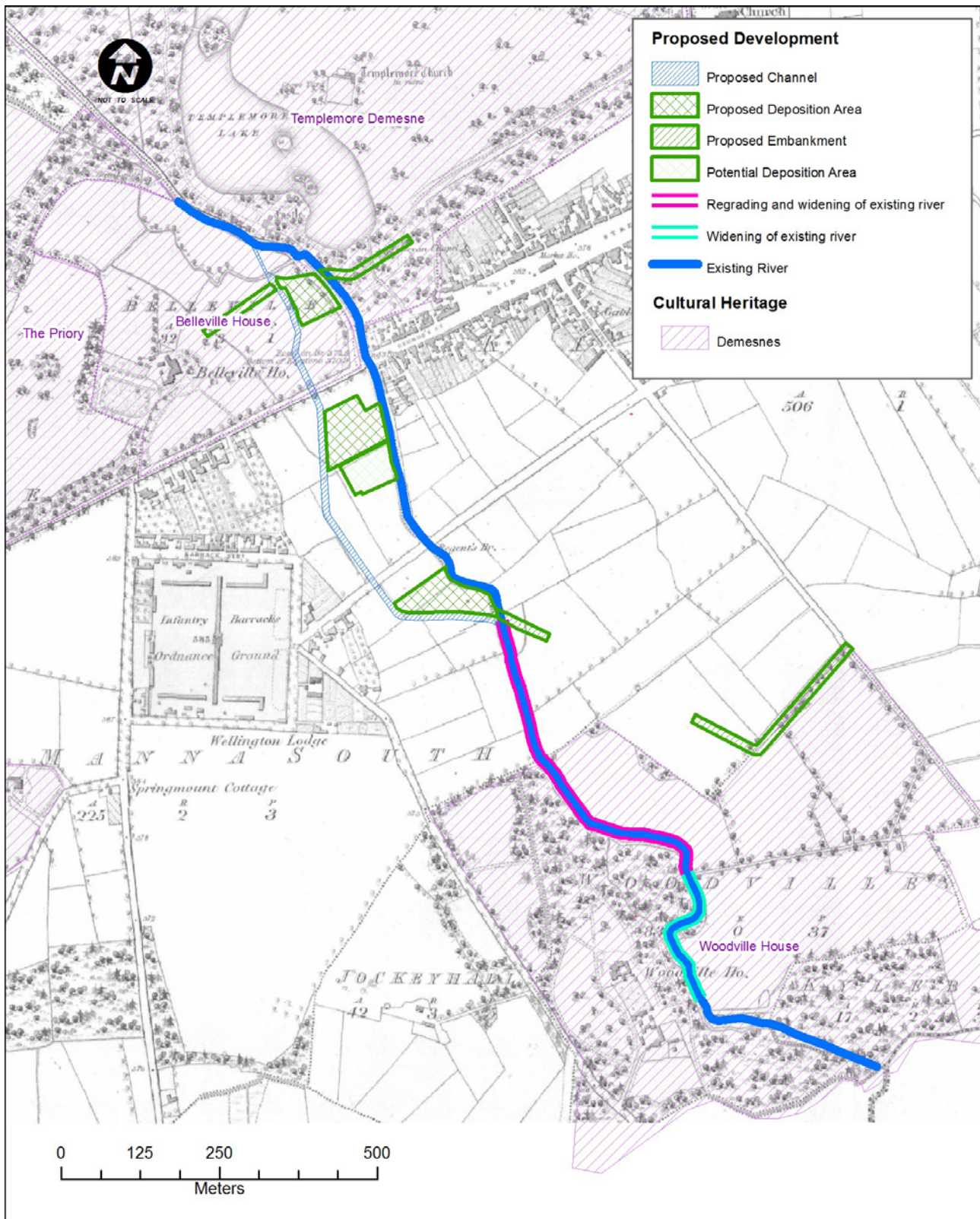
design came in the eighteenth and nineteenth centuries - with "geometric" layouts being replaced by more natural layouts in the later period. This was also the period when many of our town squares and public gardens were developed. The designs and subsequent changes reflect the aesthetic, cultural and social aspirations of their owners and users.

The objective of the garden survey is to record the extent of Ireland's historic gardens and designed landscape. Sites were identified using the 1st edition Ordnance Survey maps. These were compared with current aerial photography to assess the level of survival and change.

**Table 14-4 List of Relevant NIAH Garden/ Demesne in the vicinity of the subject area.**

Ref No	Name of Site	Status	Comments
TN-59-S-108718	Templemore Castle Demesne	Main features substantially present - peripheral features unrecognisable	Housing and sporting facilities have been constructed on the site. Much of the peripheral landscape in the north of the site is indistinguishable from surrounding farmland.
TN-59-S-101715	The Priory	Main features unrecognisable - peripheral features visible	A large agricultural/industrial site has been constructed in the core landscape. Elements of the structural footprint of the designed landscape shown on the 1836 - 1846 OS map are visible in aerial photography but features are degraded. Note two drives to the principal building have been removed.
TN-59-S-104708	Manna Cottage	Virtually no recognisable features	NA
TN-59-S-087728	Lloydsborough House	Main features unrecognisable - peripheral features visible	Few features of the designed landscape shown on the 1836 - 1846 OS map are visible in aerial photography. Much of the peripheral landscape of this site is indistinguishable from surrounding farmland. Some area of structural woodland have been removed from the peripheral landscape
NA	Belleville	Not listed in NIAH	Not Listed
TN-59-S-114706	Woodville House	Main features unrecognisable - peripheral features visible	Few features of the designed landscape shown on the 1836 - 1846 OS map are visible in aerial photography

**Figure 14-2 Extract from 1st Edition OS sheet 029 with demesnes indicated**

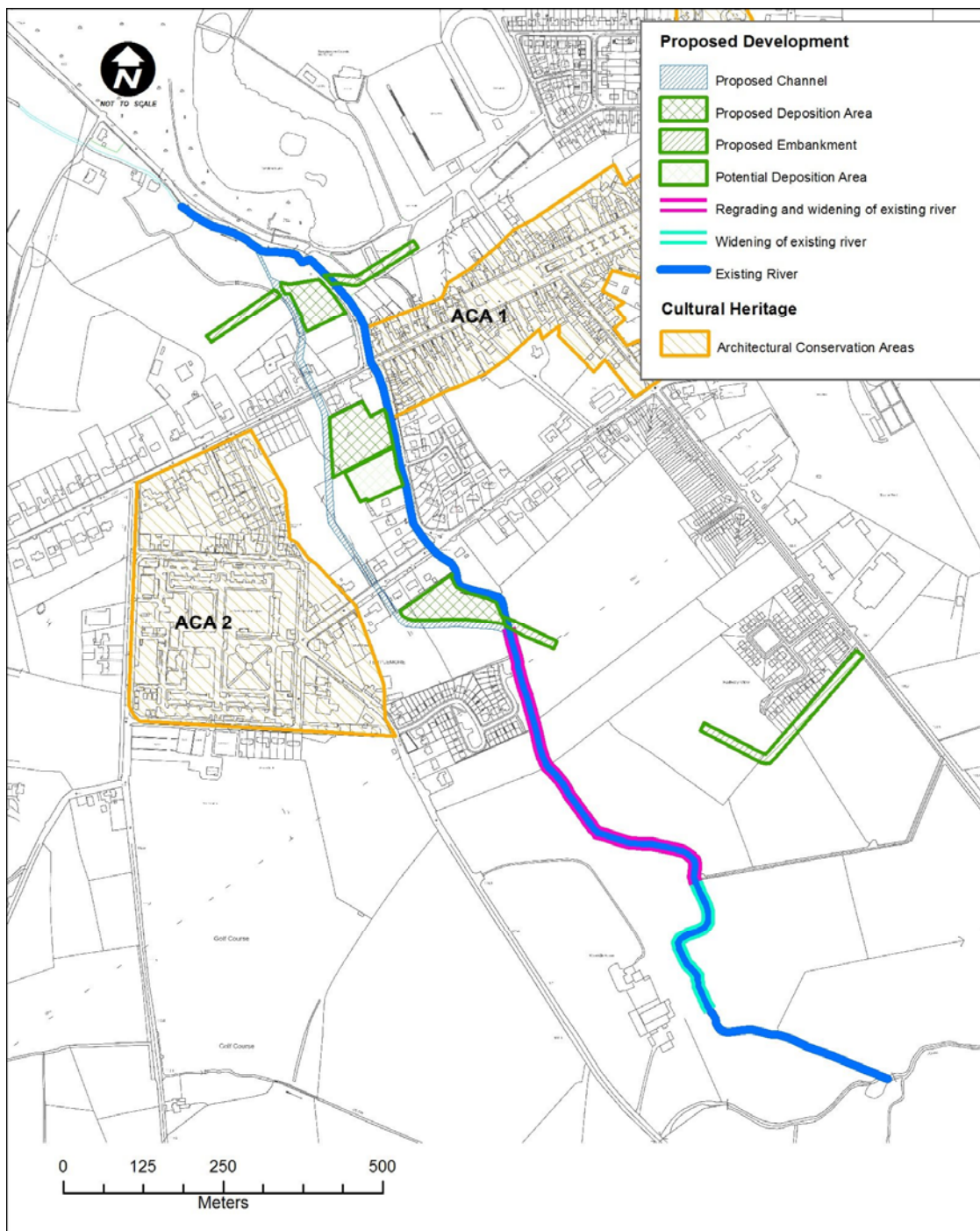




### **Architectural Conservation Area**

Architectural Conservation Areas (ACA) can be of use in order to protect the character of a place, an area, or group of structures or part of a townscape. The difference between an ACA and a protected structure is that an ACA concentrates externally on a group of buildings/structures. The Town Council through a survey and analysis of the historic environment of the town have identified three distinct areas of special interest, which have been designated as Architectural Conservation Areas. They are depicted in the following figure.

**Figure 14-3 ACA locations Templemore**



**ACA 1: Main Street/Patrick Street.**

This ACA derives its character from a number of elements notably the 19<sup>th</sup> Century Victorian Streetscape of the Main Street and the underlying local history. This area possesses a period townscape and features of a high quality and architectural integrity that is unique to the town.

**ACA 2: Main Street/Patrick Street. Infantry Barracks (Garda College), Talvera Place, including Richmond Grove and Bellevue.**

In the early 1800's the British Government chose Thurles as the location for its new Military barracks. However a 17-acre site was donated by Sir John Carden in Templemore together with the adjoining 40 acres for training and recreation. The barracks was designed and built in two squares, surrounded by company lines, stores, married quarters, Military prison, church and hospital. The Richmond Barracks as it is named and the surrounding area was quickly developed with names such as Talevera Place, Vinemara Mall and Regent Bridge.

*14.3.4 Previous Archaeological Fieldwork*

The Excavations Bulletin is both a published annual directory and an on-line database that provides summary accounts of all the excavations carried out in Ireland – North and South – from 1970 to 2010 (currently the latest edition). The number of excavations carried out annually in Ireland has fluctuated during this 40 year period. To illustrate, Excavations in 1970 has 41 reports, while Excavations in 2006 and 2007 contain over 2000. But 2010 this figure has dropped back to 846. The database gives access to summary descriptions of almost 15,000 reports and can be browsed or searched using multiple fields, including Year, County, Site Type, Grid Reference, Licence No., Sites and Monuments Record No. and Author. The online database (<http://excavations.ie>) covers the years from 1970 to 2010, with the years 2001 and 2008 published in book form. The following lists the results for the townlands of the subject area:

Reference No.	Townland	Description	Licence No.	Co-ordinates
2007:1723	Kiltillane, Templemore	No archaeological significance	06E0790	211600 172600
The site was in the north-east of Templemore, close to Templemore Demesne and north of St Mary's Church, graveyard, rectory and school. The development comprises the construction of 54 houses. The site is in a level greenfield area.				
Monitoring was undertaken intermittently between 2006 and 2007. No features of archaeological or historical interest were identified.				
Goorik Dehaene, Coolroe, Tinahely, Co. Wicklow, for Gregory Consultant Archaeology Ltd.				

Reference No.	Townland	Description	Licence No.	Co-ordinates
2007:1708	Oldtown	Settlement site; possible burnt mound(s) and linear ditch	07E0736	17111 20883
<p>Proximity to TS029–051.</p> <p>An impact assessment was required as part of further information regarding a proposed development of agricultural buildings and ancillary services on a greenfield site at Oldtown, Templemore. The site is part of a deserted settlement, and in the immediate vicinity the site of a castle is also recorded, although no earthworks are visible at ground level for either site.</p> <p>Six roughly east–west-orientated parallel test-trenches were mechanically excavated across the footprint of the proposed development on 14 July 2007. These trenches averaged 32m long, and generally extended from higher ground in the west to lower-lying wetter ground in the east. The ground at the south-eastern limit was heavily disturbed from agricultural machinery tracks traversing the site in previous winters. Three shallow deposits of burnt stone (resembling burnt-mound-type deposits and no more than 0.1m deep) were identified directly below the thin sod in Trenches 1 and 2, and extending beyond the limits of the test-trenches. Box-sections were hand-dug through these deposits, but, due to the level of disturbance in both trenches, their archaeological significance could not conclusively be proven. These deposits could be the result of vegetation clearance and burning on the site by the landowner in the early 1990s. A roughly north–south-orientated linear ditch (up to 1.63m wide and 0.6m deep) was also noted in Trenches 4–6, and hand-dug box-sections were excavated through this feature in the three Trenches. In Trench 6 the distal (and fused) end of a cow femur was identified towards the base of the section. Nothing else was recovered which might indicate modern dumping/burial of a farm animal or an archaeological date for the creation of this feature.</p> <p>It was recommended that monitoring should be undertaken as part of the proposed development; this recommendation was approved by the Department of the Environment, Heritage and Local Government. No further work has been conducted on this site to date.</p>				
Joanne Hughes, Boscabell, Cashel, Co. Tipperary.				

Reference No.	Townland	Description	Licence No.	Co-ordinates
2005:1397	BARNANE	No archaeological significance	05E1093	20650 17130
<p>Testing was carried out at Barnane, Templemore, Co. Tipperary. The development plans include the demolition of sheds and the construction of a two-storey dwelling, septic tank, percolation area and associated site works. The proposed development lies close to three monument sites. The remains of a medieval church and graveyard, SMR 28:53, is located c. 150m north-west of the development site; 28:54 is a levelled fort located c. 60m west of the site. Another levelled fort (SMR 28:89) is located c. 600m south-east of the development site. Test-trenches were excavated along the length of the access road, in the footprint of the proposed dwelling house and in the area of the percolation tank.</p> <p>Nothing of archaeological significance was recorded during the testing.</p>				
Ellen O'Carroll, The Archaeology Company, 17 Castle Street, Dalkey, Co. Dublin.				

### 14.3.5 Toponym Analysis

Townland names are a rich source of information for the land use, history, archaeology and folklore of an area. The placename can have a variety of language origins such as, Irish, Viking, Anglo-Norman and English. The names can provide information on families, topographical features, and historical incidents. In terms of the built environment many names reference churches, fords, castles, raths, graveyards, roads and passes etc. The names feature on the Ordnance Survey maps, the first edition of which was completed for the whole country circa 1842. In the compilation of the Ordnance Survey scholars such as Eugene O'Curry and John O'Donovan were commissioned to provide the Survey with the anglicised forms of the Irish place-names, and it is these anglicised forms that have been in general use ever since. In compiling the following data a number of resources were consulted including the Placenames Database of Ireland [www.logainm.ie](http://www.logainm.ie) and Irish Names of Places by P.W. Joyce (Joyce, 1913).

The town of Templemore has taken its name from the church (An Teampall Mór – the big church). Manna (north and south) has no known translation. Kylebeg townland is derived from the Irish Coill Beag or Cill Beag – the little wood or little church, suggesting the possible presence of past archaeological activity. The townland of Kiltillane, where Templemore Town is situated, takes its name from Saint Síleán who according to legend came to the area with Tenne, nephew of Niall Naoighiallach. The site of Síleán's church is not known, however there is speculation that the medieval church in Templemore Demesne (TN 029:062) may have been built on the site (Farrelly & Carey 1994, 74).

Townland Name	Irish Version	Translation
LLoydsborough	Gort Ruain	Rúain's Field
Templemore Demesne	Dhiméin an Teampaill Mhóir	The big church
Priory Demesne	Dhiméin na Prióireachta	Site of a priory
Belleville	N A	French for Good View
Kiltillane	Cill tSiolláin	The church of Siollain.
Manna South	Manna Theas	Manna (meaning uncertain)
Jockeyhall	Halla na Mharcaigh	Jockey Hall
Woodville	Cnoc Coille	The woody hill
Kylebeg	Chill Bheag	The small church

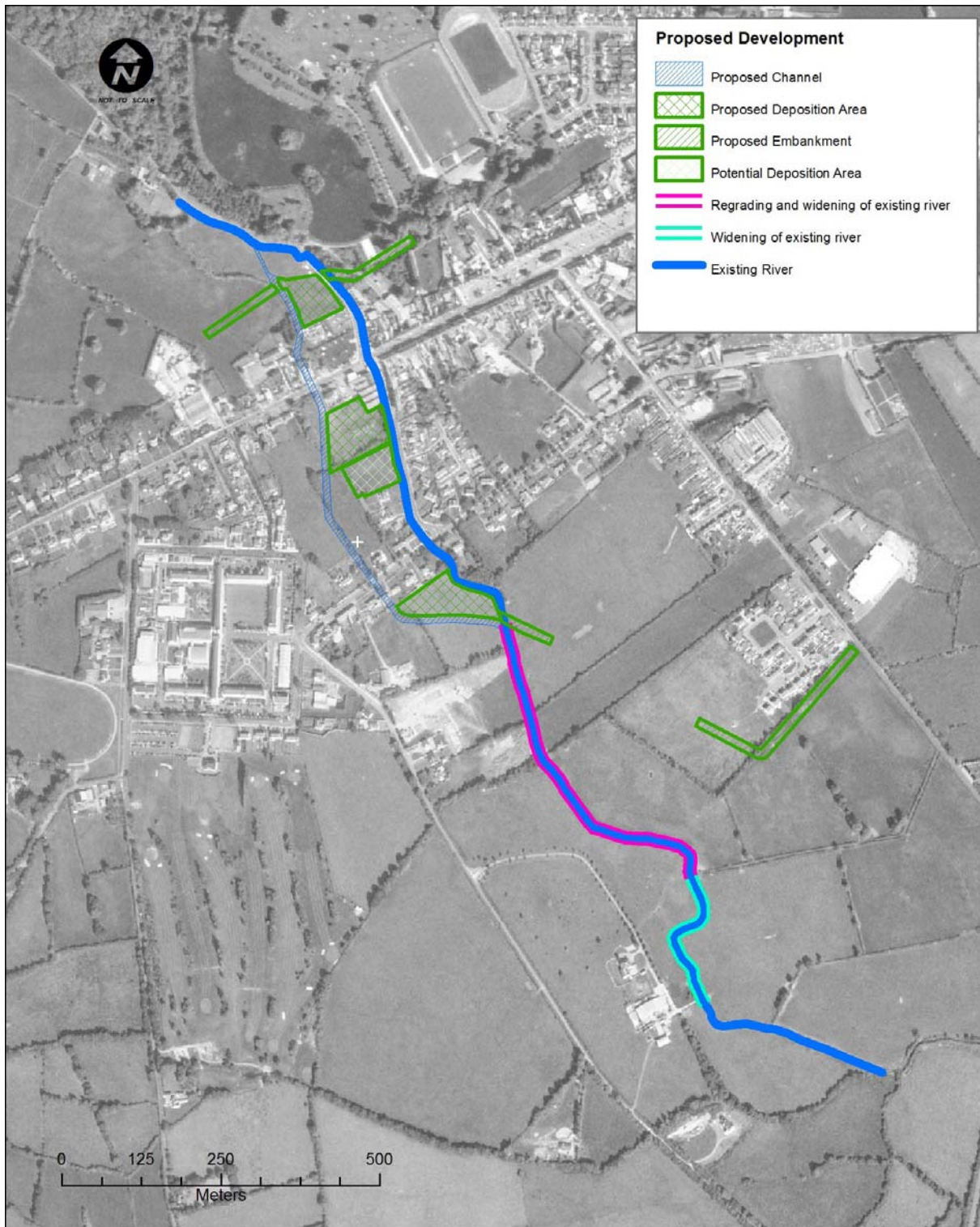
### 14.3.6 Aerial Photography

The usefulness of aerial photography is that it allows for a different perspective, 'the distant view'. Archaeological sites may show up on the ground surface, depending on their state of preservation, by light and shadow contrasts (shadow marks), tonal differences in the soil (soil marks) or differences in height and colour of the cultivated cereal (crop marks). It is also a useful aid in pinpointing existing features and can assist in ascertaining their extent and degree of preservation.



A review of online images via the OSI website and Google and Bing Maps did not note any additional previously unrecorded sites along the route of the proposed scheme (refer to Figure 14-4).

**Figure 14-4 Aerial photograph with proposed development indicated**

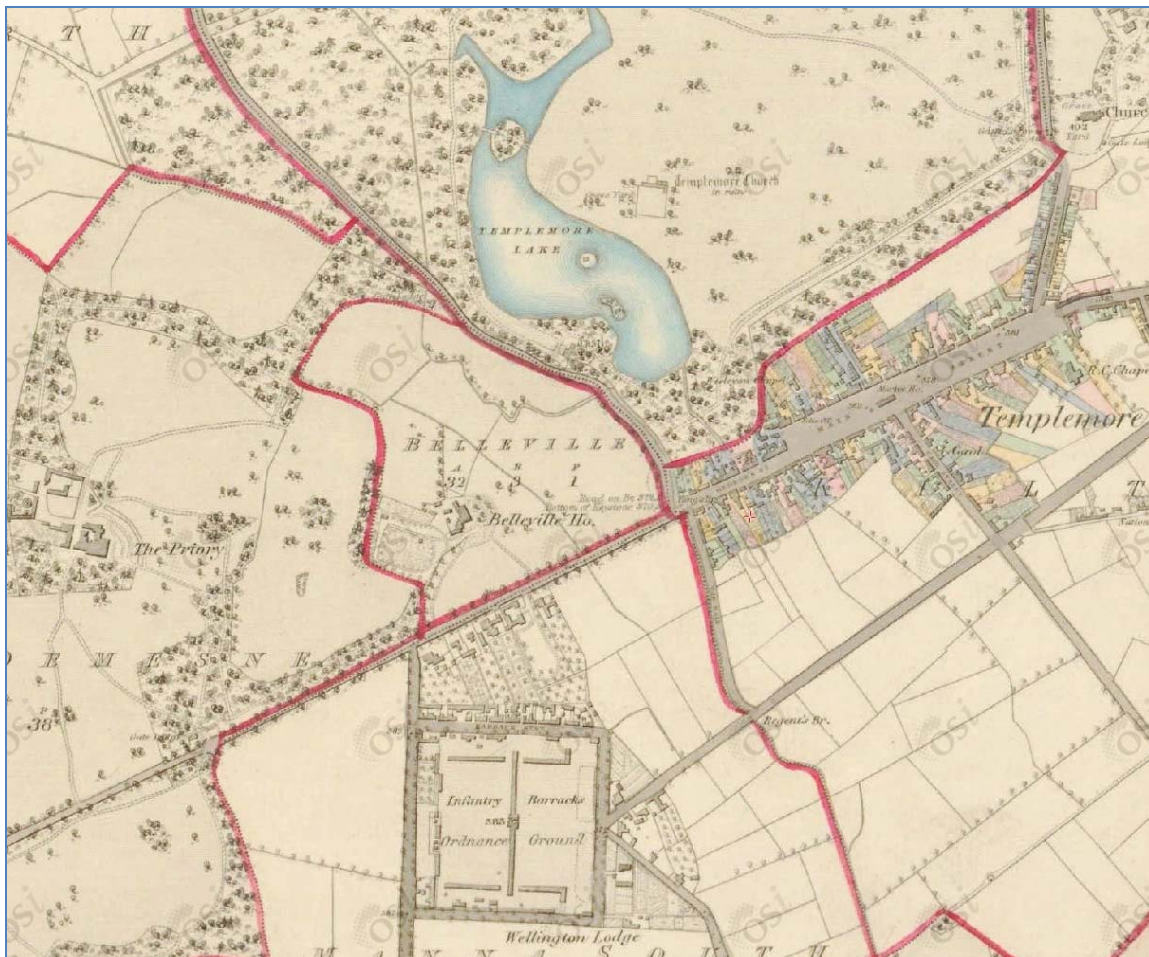


#### 14.3.7 Cartographic Research

Analysis of historic mapping shows how the landscape has changed over time. The comparison of editions of historic maps can show how some landscape features have been created, altered or removed over a period of time. Sometimes features that appear on these early maps are found to be of potential archaeological significance during fieldwork. For this study the following historic maps were consulted:

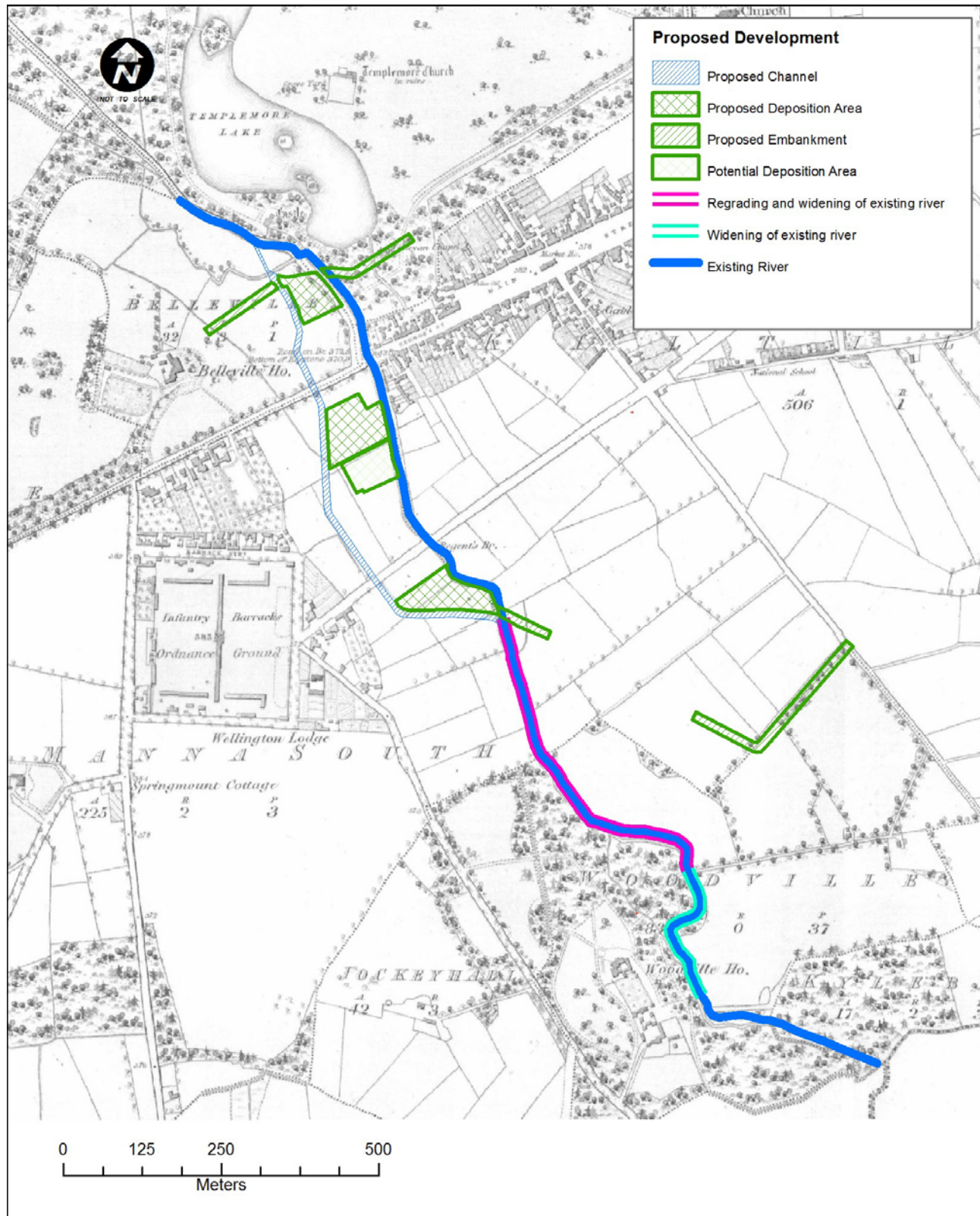
- Down Survey Map of Eliogarty;
- First edition Ordnance Survey 6" Maps circa 1830; and
- Second edition Ordnance Survey 25" Maps circa 1900.

No additional archaeological sites were noted from a review of the above sources.





**Figure 14-5 Extract from 1<sup>st</sup> ed. Map with proposed development indicated**



Sheet 29 of the First Edition Ordnance Survey (1843) was inspected for additional sites or features. The street pattern and plan of the town is quite similar to how it appears today. The main street has the familiar wide thoroughfare. There is little development along the Mall. The most obvious complex is the Infantry Barracks and Ordnance Ground. The demesne landscapes of the large houses in the area are shown in detail including Priory Demesne, Templemore Demense, Belleville and Woodville house.

A number of associated lodges are also shown.

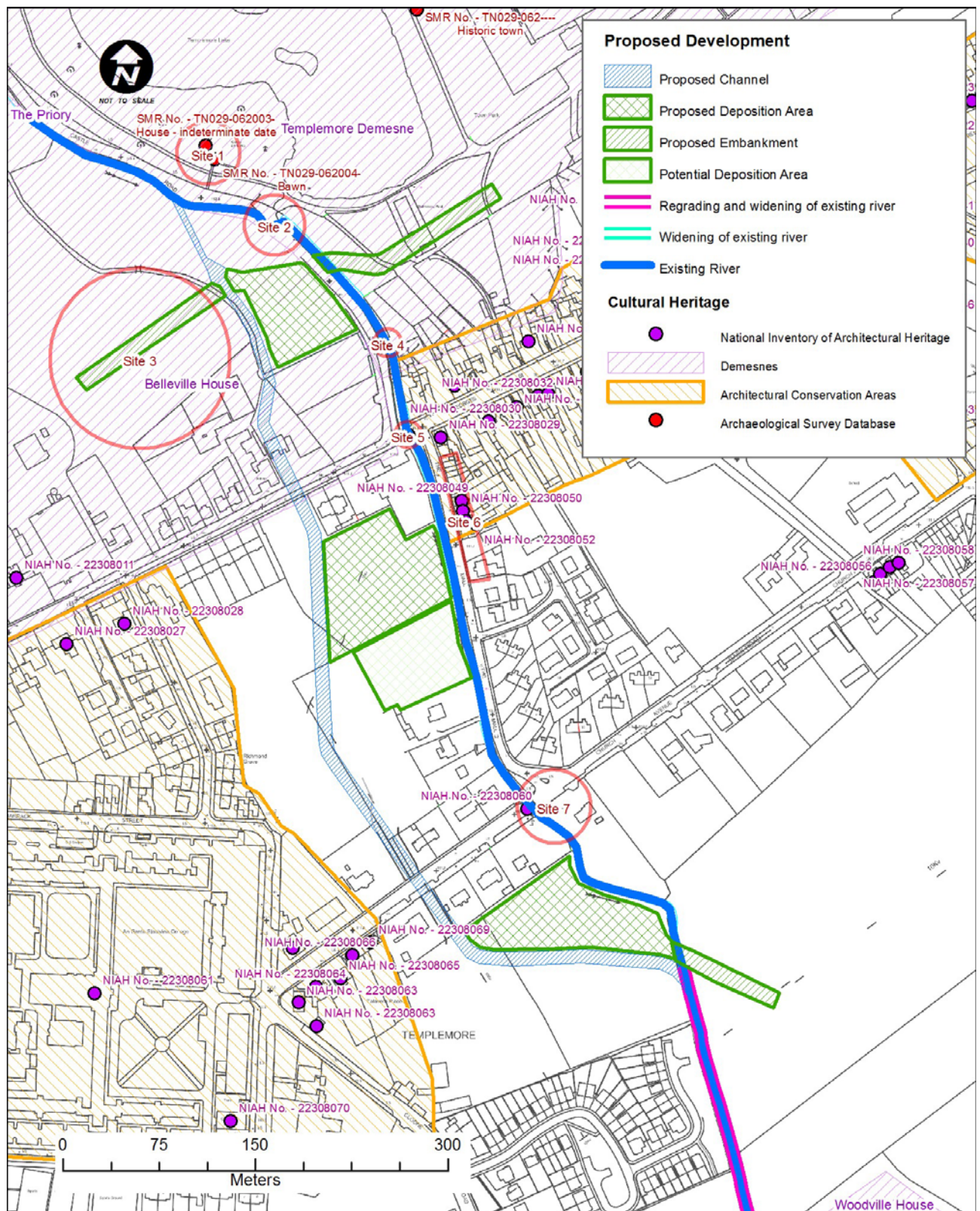
#### 14.4 Sites Identified during Fieldwork

The field walkover carried out by Moore Group in 2004 and 2014 and covered the entire area to be impacted by the proposed scheme. It noted the proximity of the works to the surrounding RMP sites and also topographical undulations which may be indicative of the presence of previously un-recorded archaeological deposits. The field walkover commenced at Templemore Demesne in the northern end of the town and travelled south to the terminus south of Cloone Bridge. It concluded that there were several areas of significance noted along the project route (Sites 1-8). It is noteworthy that the proposed scheme, including new channel, deposition areas and embankments will not impact on any recorded monuments, protected/NIAH structures or ACA sites. The proposed scheme will however pass very close to three recorded monuments Sites 1 (RMP TN 029-062002 -Castle, TN 029-062004-Bawn & TN 029-062003 –House). Other cultural heritage sites identified include a number of bridges, an earthen anomaly at Belleville and the architectural heritage of the Mall.

Although not numbered below, it is noted that the bed and banks of the river to the south of confluence of the proposed channel are to be regraded and widened.

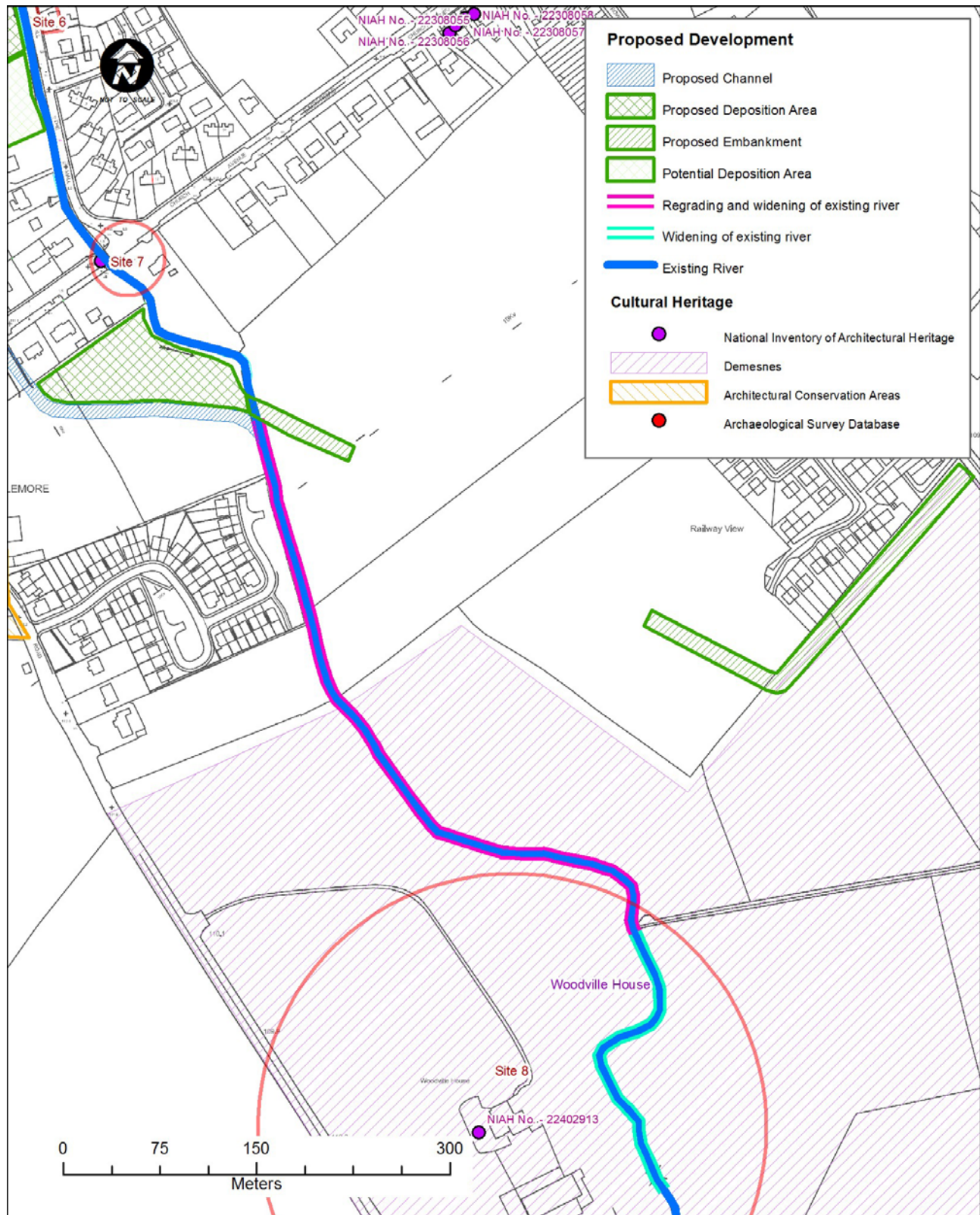


**Figure 14-6 Long Diversion showing Sites nos. 1-7**





**Figure 14-7 Long Diversion showing Sites nos. 7–8**





#### 14.4.1 Site 1 Castle, bawn and house

Site No.	Classification	Townland	Status	Historic Maps
1	Tower House, Bawn and House	Templemore Demesne	RMP's TN029-062002, 062003 & 062004	Featured as a Castle on 1 <sup>st</sup> ed map and on 2 <sup>nd</sup> ed. 25" map.

Description: Situated on a natural hillock with good views in all directions. Described in the Civil Survey (1654-6) as 'a Castle and the Walls of a stone house out of repaire' (Simington 1931, vol. 1, 78). James Earl of Ormond is listed as proprietor in 1640 (ibid.). A large rectangular three-storey tower house (TN029-062002) composed of roughly coursed limestone rubble, with substantial base-batter and dressed quoins. Most of the base-batter has been robbed and this has revealed an internal facing. The S and W walls are supported by tall buttresses, the bases of which have also been robbed. The E wall and E end of the N wall have been destroyed. The remains of a bawn wall (T 1.6m) extend N-S from roughly the centre of the N wall and extend E-W from the S wall.) Though the tower house (TN029-062002) may have been modified and inhabited in the seventeenth century, the reference in the Civil Survey suggests that the stone house was a separate building. Though the tower house (TN029-062002) may have been modified and inhabited in the seventeenth century, the reference in the Civil Survey suggests that the stone house was a separate building.

#### 14.4.2 Site 2 Shortt's Bridge

Site No.	Classification	Townland	Status	Historic Maps
2	Shortt's Bridge	Templemore Demesne	Not listed as an RPS/RMP/NIAH	Not annotated on 1 <sup>st</sup> ed map or 2 <sup>nd</sup> ed. 25" map.

Description: Road bridge over narrow stream on northern edge of Templemore Town. Bridge consists of a single-arched hump back road bridge with cut stone voussoirs and a random rubble parapet wall with upright coping. SW parapet wall has been significant altered in recent times



Plate 14-1 Site 2 Shortt's Bridge

#### 14.4.3 Site 3 Site of Archaeological potential in Shortt's Field

Site No.	Classification	Townland	Status	Historic Maps
3	Site of Archaeological potential	Bellleville	Not listed as an RMP	Not featured on historic mapping.
<p>Description: To the East of the junction between these aforementioned field boundaries there is a rectangular bank measuring approximately 30m x 30m. The bank is several metres wide and approximately 1m higher than the surrounding ground surface. The exterior of the bank is less pronounced along the eastern edge where it slopes down gradually. The interior of the feature is approximately 0.8m below the top of the bank. Several large unworked stones were identified along the interior edge of the bank.</p>				



**Plate 14-2 Site 3 AAP Shortt's Field**

#### 14.4.4 Site 4 Bridge and Structure

Site No.	Classification	Townland	Status	Historic Maps
4	Road Bridge	Templemore Demesne	Not listed as an RPS/RMP/NIAH	Featured on 2 <sup>nd</sup> ed. 25" map.
<p>Description: Single-arched bridge with cut stone voussoirs with remains of two-bay stone building surmounting bridge. Carriageway opening to front with cut stone surround and voussoirs. Some patchy remains of lime render to walls. Building may have originally been higher, as it appears to have undergone some demolition. Building is not shown on the 1<sup>st</sup> edition (1843) OS map; however it is shown on the 2<sup>nd</sup> (1902-03) edition OS map. The 2<sup>nd</sup> edition also describes a Masonic Hall in this area but it is not clear as to what structure it is referring to.</p>				



**Plate 14-3 Site 4 Bridge and Structure**

#### 14.4.5 Site 5 O'Dwyer Bridge

Site No.	Description	Townland	Status	Historic Maps
5	O'Dwyer Bridge formerly King's Bridge	Killtillane	Not listed as an RPS/RMP/NIAH	Featured as Kings Bridge on both the 1 <sup>st</sup> ed map and 2 <sup>nd</sup> ed. 25" map.
<p>Description: Single-arched hump back bridge with cut stone voussoirs displaying surface dressing and drafted margins. Parapet walls of rubble blocks built to courses with dressed coping. Bridge is called King bridge on the 1<sup>st</sup> (1843) and 2<sup>nd</sup> (1902-03) edition OS maps, it was renamed after Liet. Thomas O'Dwyer. There is a stone carriage stop on the west side of the bridge.</p>				



**Plate 14-4 Site 5 O'Dwyer Bridge**



#### 14.4.6 Site 6 The Mall

Site No.	Description	Townland	Status	Historic Maps
6	The Mall	Killtillane	Included in ACA and house NIAH reg no 22308050. Rating-Regional r	Featured on both the 1 <sup>st</sup> ed map and 2 <sup>nd</sup> ed. 25" map.
Description: The Mall runs along the eastern side of the river. Most houses are quite recent and both the 1st edition (1843) and the 2nd edition (1902-03) only show buildings on the northern side of the street. These buildings appear to be mainly 19th century in date				



**Plate 14-5 Site 6 The Mall**

#### 14.4.7 Site 7 Small Bridge

Site No.	Description	Townland	Status	Historic Maps
7	Small Bridge formerly Regent's Bridge	Killtillane	Not listed as an RPS/RMP/NIAH	Featured as Regent's Bridge on both the 1 <sup>st</sup> ed map and 2 <sup>nd</sup> ed. 25" map.
Description: Single-arched hump back road bridge on Back road with cut stone voussoirs displaying surface dressing and drafted margins. Parapet walls appear to have been rebuilt. The bridge is called Regent Bridge on the 1 <sup>st</sup> (1843) and 2 <sup>nd</sup> (1902-03) edition OS maps, it was renamed after Capt. Michael Small, who was killed in action in July 1920				



**Plate 14-6 Site 7 Small Bridge**

#### 14.4.8 Site 8 Woodville House and Demense

Site No.	Description	Townland	Status	Historic Maps
8	Woodville Demense	Woodville	RPS No. S405 Listed on the NIAH Garden Survey- Main features unrecognisable - peripheral features visible	Featured as a demesne on both the 1 <sup>st</sup> ed map and 2 <sup>nd</sup> ed. 25" map.
<p>Description: Woodville House is a three bay, two storey house with hipped slate roof. Cut stone single storey pediment type protrusion on ground floor centre bay. It has a hipped slate roof and rendered walls. There is a cut stone pedimented porch to the front elevation. There are outbuildings to the rear site. This structure is included in the Record of Protected Structures (Ref. No. S405) for North Tipperary. House is shown on the 1<sup>st</sup> (1843) and 2<sup>nd</sup> (1902-03) edition OS maps.</p>				



**Plate 14-7 Site 8 Woodville Demesne**



## 14.5 Potential Impacts

### 14.5.1 Introduction

Two flood relief scheme scenarios were considered in this assessment:

- A. The river will be left in its current channel route, with the new channel taking only flood flows; and
- B. The river is diverted in full to the new channel.

### 14.5.2 Evaluation of Impacts

In line with EPAs Guidelines on the Information to be Contained in Environmental Impact Statements (March 2002) and DoECLGs Guidelines for Planning Authorities and An Bord Pleanála on carrying out Environmental Impact Assessment; the impact upon designated and undesignated archaeological, architectural and cultural heritage sites, structures, monuments or features been evaluated using the following criteria:

#### **Quality of Impacts**

- Positive Impact: A change that improves or enhances an archaeological, architectural or cultural heritage site, structure, monument or feature or its setting;
- Neutral Impact: A change that does not affect an archaeological, architectural or cultural heritage site, structure, monument or feature or its setting; and
- Negative Impact: A change that will remove or negatively alter, whether in its entirety or not, an archaeological, architectural or cultural heritage site, structure, monument or feature, or detract from an observer's enjoyment or appreciation of its setting.

#### **Significance of Impacts**

- Imperceptible Impact: An impact capable of measurement but without noticeable consequences;
- Slight Impact: An impact, which causes noticeable changes in the character of the environment without affecting its sensitivities;
- Moderate Impact: An impact that alters the character of the environment in a manner that is consistent with existing and emerging trends;
- Significant Impact: An impact, which, by its character, magnitude, duration or intensity alters a sensitive aspect of the environment; and
- Profound Impact: An impact, which obliterates sensitive characteristics.

### 14.5.3 Duration of Impacts

- Short-term Impact: Impact lasting one to seven years;

- Medium-term Impact: Impact lasting seven to fifteen years;
- Long-term Impact: Impact lasting fifteen to sixty years;
- Permanent Impact: Impact lasting over sixty years; and
- Temporary Impact: Impact lasting for one year or less.

#### 14.5.4 Types of Impacts

- Cumulative Impact: The addition of many small impacts to create one larger, more significant impact;
- 'Do-Nothing Impact': The environment as it would be in the future should no development of any kind be carried out;
- Indeterminable Impact: When the full consequences of a change in the environment cannot be described;
- Irreversible Impact: When the character, distinctiveness, diversity or reproductive capacity of an environment is permanently lost;
- Residual Impact: The degree of environmental change that will occur after the proposed mitigation measures have taken effect; and
- 'Worst Case' Impact: The impacts arising from a development in the case where mitigation measures substantially fail.

#### 14.5.5 Construction Phase

Potential construction impacts may be direct, physical impacts on known and previously unrecorded archaeological, architectural or cultural heritage sites, structures, monuments or features. Care has been taken during the design stage to avoid such impacts, however, where there remains a potential for such impacts mitigation measures are recommended. In relation to the proposed scheme, direct, physical impacts on the archaeological, architectural and cultural heritage can manifest themselves in the following ways:

- Where an archaeological, architectural or cultural heritage site, structure, monument or feature is located within an area where works takes place and the works either intentionally or unintentionally entail the alteration or removal of all or part of the site, structure, monument or feature a direct, physical impact will occur;
- Direct, physical impacts can also occur in gaining access to the site. Where archaeological, architectural or cultural heritage sites, structures, monuments or features are intentionally or unintentionally removed or altered when transporting and / or facilitating access for machinery, equipment and / or materials to or from site a direct physical impact will occur.
- There is the potential for direct, physical impacts on previously unrecorded archaeological and architectural sites, structures, monuments or features.

If these impacts cannot be remediated, for example if archaeological deposits are destroyed during excavations, then the impacts will be permanent. The following assess the impacts of the development on the twelve individual Cultural Heritage sites with regard to two scheme scenarios:

- A. The river will be left in its current channel route, with the new channel taking only flood flows; and
- B. The river is diverted in full to the new channel.

In both instances the impacts are the same or neutral.

#### 14.5.6 Direct Physical Impacts on Known Archaeological and Architectural Sites

Site No	Classification	Townland	ITM Ref	Distance from development
1	Tower House, Bawn and House RMP's TN029-062002, 062003 & 062004	Templemore Demesne	610732, 671803	90m
<b>Potential Direct Impacts:</b> There is a potential that groundworks could have a negative impact on sub surface deposits associated with the wider site.				
<b>Mitigation Measures:</b> It is recommended that archaeological monitoring be carried out in the vicinity of the proposed development location. (refer to Figure 14.6).				
<b>Residual Impacts:</b> In the event that there are archaeological deposits discovered during archaeological monitoring they will be excavated in full consultation with the National Monuments Service of the DAHG.				

Site No	Classification	Townland	ITM Ref	Distance from development
2	Shortt's Bridge	Templemore Demesne	610798/671775	0m
<b>Potential Direct Impacts:</b> Negligible				
<b>Mitigation Measures:</b> It is recommended that the site be noted in the CEMP and that on site personnel be made aware of the sites significance and due care and attention be taken to prevent any inadvertent damage by site traffic during construction.				
<b>Residual Impacts:</b> The residual impacts will be positive in alleviating future flooding incidents.				

Site No	Classification	Townland	ITM Ref	Distance from development
3	Site of Archaeological potential	Bellville	610694, 671671	40m
<b>Potential Direct Impacts:</b> There is a potential that groundworks could have a negative impact on both surface and sub-surface features				
<b>Mitigation Measures:</b> It is recommended that archaeological testing, under licence to the DAHG is carried out at this location in advance of any works, or that measures be taken to avoid the site.				
<b>Residual Impacts:</b> In the event that there are archaeological deposits discovered during archaeological monitoring they will be excavated in full consultation with the National Monuments Service of the DAHG.				

Site No	Classification	Townland	ITM Ref	Distance from development
4	Bridge and Structure	Templemore Demesne	610883, 671662	90m
<b>Potential Direct Impacts:</b> Negligible.				
<b>Mitigation Measures:</b> It is recommended that the site be noted in the CEMP and that on site personnel be made aware of the sites significance and due care and attention be taken to prevent any inadvertent damage by site traffic during construction.				
<b>Residual Impacts:</b> The residual impacts will be positive in alleviating future flooding incidents.				

Site No	Classification	Townland	ITM Ref	Distance from development
5	O'Dwyer Bridge	Killtillane	610895/671593	90m
<b>Potential Direct Impacts:</b> Negligible.				
<b>Mitigation Measures:</b> It is recommended that the site be noted in the CEMP and that on site personnel be made aware of the sites significance and due care and attention be taken to prevent any inadvertent damage during construction.				
<b>Residual Impacts:</b> The residual impacts will be positive in alleviating future flooding incidents.				

Site No	Classification	Townland	ITM Ref	Distance from development
6	The Mall	Kiltillane	610926/671559	90m
<b>Potential Direct Impacts:</b> Negligible.				
<b>Mitigation Measures:</b> It is recommended that the site be noted in the CEMP and that on site personnel be made aware of the sites significance and due care and attention be taken to prevent any inadvertent damage by site traffic during construction.				
<b>Residual Impacts:</b> The residual impacts will be positive in alleviating future flooding incidents.				

Site No	Classification	Townland	ITM Ref	Distance from development
7	Small Bridge	Killtillane	610997/671304	0m
<b>Potential Direct Impacts:</b> Negligible.				
<b>Mitigation Measures:</b> It is recommended that the site be noted in the CEMP and that on site personnel be made aware of the sites significance and due care and attention be taken to prevent any inadvertent damage during construction work.				
<b>Residual Impacts:</b> The residual impacts will be positive in alleviating future flooding incidents.				

Site No	Classification	Townland	ITM Ref	Distance from development
8	Woodville Demesne	Woodville	611331/670611	70m
<b>Potential Direct Impacts:</b> Negligible.				
<b>Mitigation Measures:</b> It is recommended that the site be noted in the CEMP and that on site personnel be made aware of the sites significance and due care and attention be taken to prevent any inadvertent damage during construction.				
<b>Residual Impacts:</b> The residual impacts will be positive in alleviating future flooding incidents.				

#### *14.5.7 Other Direct Physical Impacts*

The proposed development will impact on greenfield areas where the new channel is to be excavated, where proposed embankments are to be constructed and deposition areas. There is the potential that excavations associated with the construction of the proposed development in these greenfield areas could negatively impact on previously unrecorded archaeological deposits.

It is noted that the proposed development could impact on archaeological deposits or stray finds associated with the existing river. To the south of the confluence point, where the river and the proposed channel meet, the proposed development includes widening of the river and grading of the river bed for several hundred metres. There is the potential that such development works could have a negative impact on previously unrecorded archaeological remains or stray finds in the river bank or river bed. Without mitigation this could lead to the destruction of such deposits or finds.

#### *14.5.8 Indirect Impacts*

Should it be found that Scenario B is the preferred option, the existing river bed will dry up and there is the potential that this could lead to a negative impact on archaeological stray finds or architectural fragments that may be exposed. If removed and not brought to the attention of the relevant archaeological or architectural authorities they could be lost to the archaeological or architectural record.

### **14.6 Mitigation Measures**

#### *14.6.1 Construction Phase*

##### **Direct Physical Impacts**

The best form of mitigation, preservation in situ, is achieved by routing to avoid direct, physical impacts upon archaeological, architectural and cultural heritage site, structures monuments and features. All designated archaeological, architectural and cultural heritage sites, structures, monuments or features have been avoided by the design team as far as was practicably possible, taking into account all the environmental constraints.

The National Monuments Acts 1930-1994 require that in the event of the discovery of archaeological finds or remains that the relevant authorities, the National Monuments Service of the DAHG and the National Museum of Ireland, should be notified immediately. Allowance will be made for full archaeological excavation, in consultation with the National Monuments Service of the DAHG, in the event that archaeological remains are found during the construction phase.



In areas where there is the potential that archaeological, architectural or cultural heritage site, structures, monuments or features could be impacted on during the construction phase, one or more of the following mitigations measures have been recommended:

- Archaeological monitoring – in areas of moderate archaeological potential, excavations associated with construction works and / or facilitating access to the construction site and / or stringing areas will be monitored by a suitably qualified archaeologist;
- Archaeological testing – best practice in areas of high archaeological potential demands caution, to ensure that archaeological deposits are identified as early as possible, thereby ensuring that any loss from the archaeological record is minimised. Under a monitoring remit, an archaeologist will observe normal construction works, usually undertaken with a toothed excavator bucket, which makes it more difficult to identify archaeological deposits. During archaeological testing a licence eligible archaeologist supervises excavations undertaken with a toothless grading bucket, under licence to the National Monuments Service of the DAHG, thereby ensuring the early identification of archaeological deposits and minimal loss to the archaeological record. Undertaking this work preconstruction, will ensure that sufficient time can be allowed within the construction schedule for the excavation of any archaeological deposits discovered; and
- Note importance of site in CEMP and inform on site personnel – where there are sites located in close proximity to the proposed development that could be inadvertently impacted during the construction phase these will be noted in the CEMP and on site personnel be made aware of the sites significance and due care and attention will be taken to prevent any inadvertent damage during construction work.

Where it was found that there is a potential that the proposed development could impact on previously recorded archaeological sites, these sites have been discussed in detail Section 14.6.1. For ease of readability details of mitigation measures and residual impact have also been discussed in Section 14.6.1. In summary the mitigation measures recommended for the individual sites are indicated in the table overleaf.

Site No. / Name	Mitigation
Site 1 / Tower House, Bawn and House RMP TN029-062	Archaeological monitoring or works in the vicinity
Site 2 / Shortt's Bridge	Note importance of site in CEMP and inform on site personnel of the sites importance.
Site 3 / Site of Archaeological Potential	Archaeological testing under licence to the National Monuments Service of the DAHG
Site 4 / Bridge structure	Note importance of site in CEMP and inform on site personnel of the sites importance.
Site 5 / O'Dwyers Bridge	Note importance of site in CEMP and inform on site personnel of the sites importance.
Site 6 / The Mall	Note importance of site in CEMP and inform on site personnel of the sites importance.
Site 7 / Small Bridge	Note importance of site in CEMP and inform on site personnel of the sites importance.
Site 8 / Woodville Demesne	Note importance of site in CEMP and inform on site personnel of the sites importance.

In greenfield areas, where excavations associated with the construction of the proposed development could impact on previously unrecorded archaeological deposits, such as the proposed channel, embankments and deposition areas, a suitably qualified archaeologist will monitor topsoil stripping.

To the south of the confluence point where the proposed new channel meets the existing river, the river is to be widened and regraded. Prior to construction works an underwater archaeological survey of the area will be undertaken including a dive wade / survey to ascertain if notable archaeological deposits or stray finds remain in situ in the river banks or river bed. During the construction phase a suitable qualified underwater archaeologist will monitor dredging works and river widening works under licence to the Underwater Section of the National Monuments Service of the DAHG.

Mitigation measures are summarised in Figures 14.8 and 14.9.

**Figure 14-8 Mitigation Measures sheet 1 of 2**

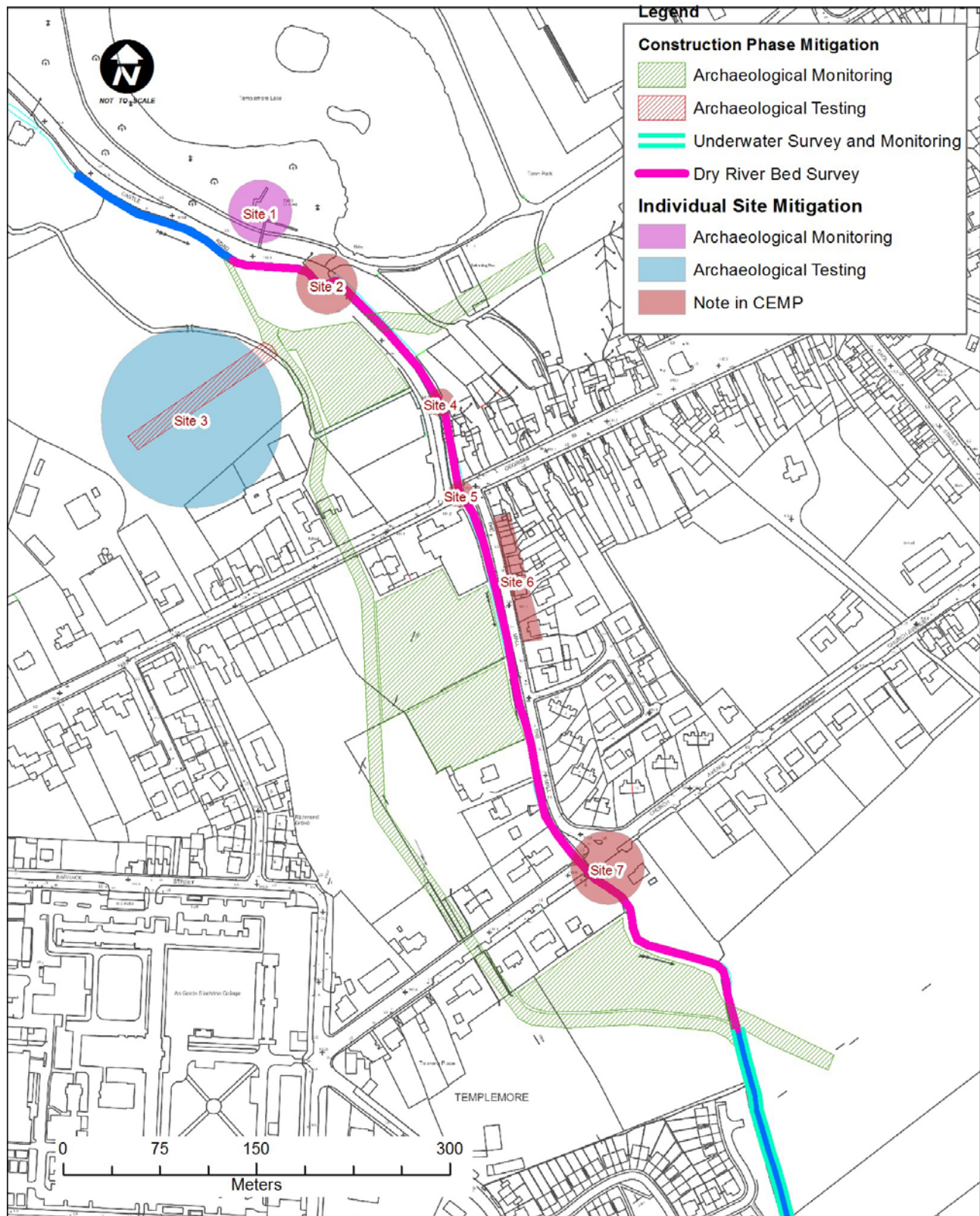
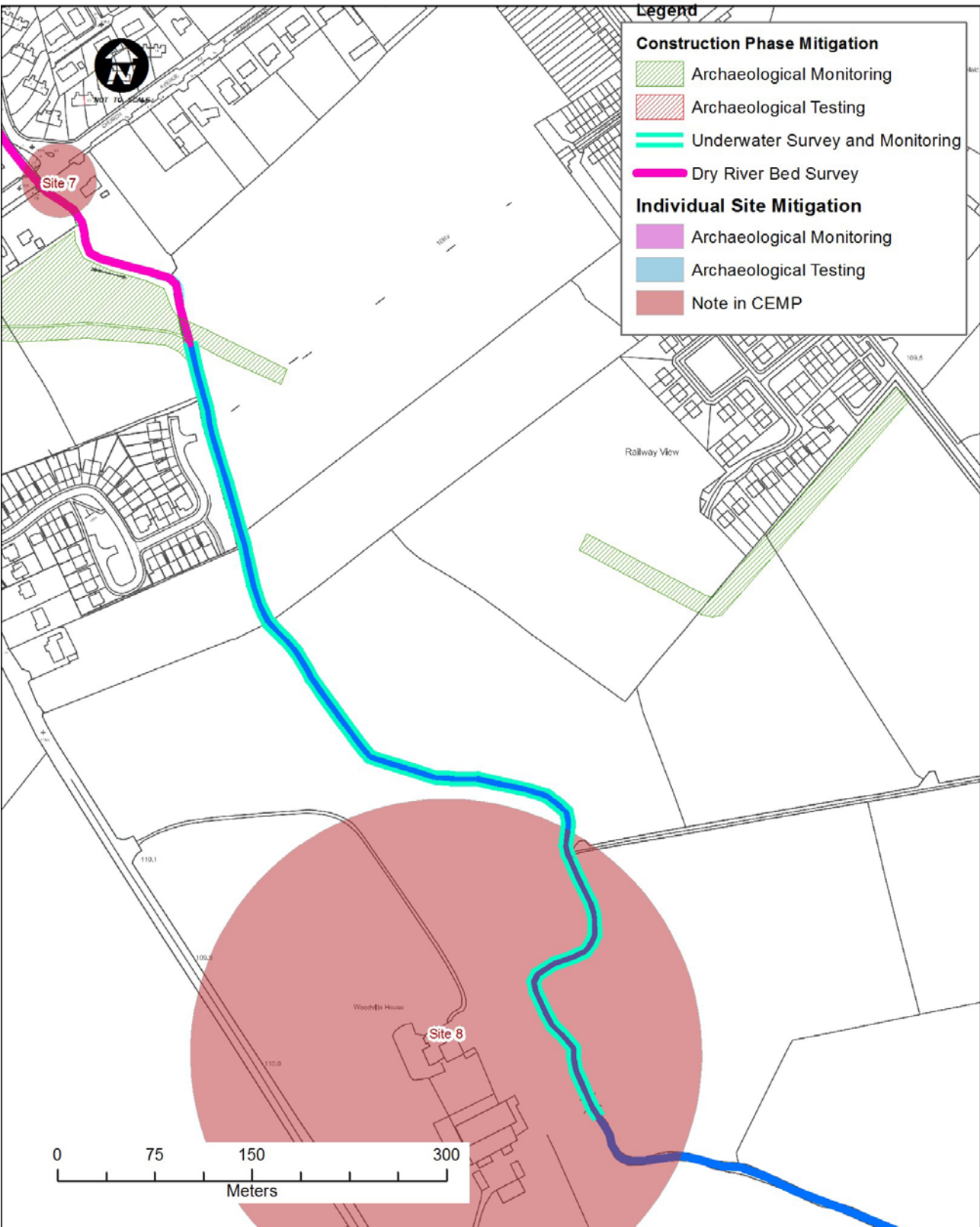


Figure 14-9 Mitigation Measures sheet 2 of 2





## **Indirect Impacts**

Should Scenario B be chosen as the preferred option, then once the river has been diverted and the existing river has dried up, a suitably qualified archaeologist shall undertake a visual and metal detection survey of the river bed to retrieve any archaeological stray finds or architectural fragments that may be found there. Prior to undertaking the work, a metal detection licence shall be obtained from the National Monuments Service of the DAHG.

### *14.6.2 Operational Phase – Maintenance/upgrade works.*

Potential impacts on archaeological, architectural or cultural heritage sites, monuments, structures or features during maintenance or upgrade works that may be required during the operational phase of the proposed scheme are best mitigated through ongoing liaison with the National Monuments Service and the Architectural Heritage Advisory Unit at the DAHG and local heritage and conservation officers within the County Council.

## **14.7 Residual Impacts**

### *14.7.1 Archaeological*

#### **Construction Phase**

Following mitigation there will be no direct physical impacts on the upstanding remains of any known archaeological monuments during the construction phase of the proposed scheme.

There is the potential that construction of the proposed development could impact on previously unrecorded archaeological deposits in the vicinity of the tower house, bawn and house (SMR No. TN029-062), site 1 an area of archaeological potential noted during the site walkover and in Greenfield areas. In all these areas either archaeological monitoring or archaeological testing has been recommended to ensure that should archaeological deposits be discovered that these will be dealt with in accordance with best practice and in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

Should Scenario B be chosen as the preferred option, there is the potential that as the Mall River dries that archaeological stray finds and architectural fragments could be exposed. Once the river has dried, a suitably qualified archaeologist will undertake a metal detection and visual survey to ensure that any such finds are retrieved and not potentially lost to the archaeological or architectural record.

Where the river is to be widened and the river bed regraded, an underwater archaeological survey will be undertaken prior to construction, and during construction archaeological monitoring will be undertaken. This will ensure that any finds or archaeological deposits will be dealt with in accordance



with best practice and in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland.

### **Operational Phase**

There will be no ongoing impacts on the setting of archaeological monuments throughout the operation phase of the development.

#### *14.7.2 Architectural*

### **Construction Phase**

Following mitigation there will be no direct physical impacts on the upstanding remains of any known architectural sites during the construction phase of the proposed scheme.

### **Operational Phase**

There will be no ongoing impacts on the setting of architectural structures throughout the operation phase of the scheme.

## **14.8 Conclusions**

At this stage the following conclusions and recommendations can be made:

- That archaeological testing be carried out on the previously unknown possible archaeological site to assess its archaeological potential prior to development works commencing (or) this area would be demarcated and be off limits to construction traffic during the development works. If feasible the embankment at this location should be moved to the north to avoid directly impacting on the feature.
- All ground works associated with the new channel to be monitored by a suitably qualified archaeologist with full provision made for further mitigation in the event of archaeological material being discovered.
- Any topsoil stripping of Greenfield areas associated with embankments or deposition area will be monitored by a suitably qualified archaeologist with full provision made for further mitigation in the event of archaeological material being discovered.
- Where the river is to be regraded and / or widened underwater archaeological survey and archaeological monitoring will be undertaken with full provision further mitigation in the event of archaeological material being discovered.
- Once the river has been diverted the river bed will be inspected for stray archaeological finds or architectural fragments.

## 15 INTERACTIONS OF THE FOREGOING

The EIA Directive requires that the interactions and interrelationships between environmental factors be considered. Interactions have been clearly identified in the early stages of the project and where the potential exists for interaction between environmental impacts, the EIS specialists have taken the interactions into account when making their assessment.

### 15.1 Human Beings/Socio Economic

Human Beings will interact with other relevant topics given the nature of the works. Noise and vibration, aspects related to air and water quality regimes and the impact on flora and fauna, have minimal potential to change the receiving environment. Natural re-colonisation of flora and fauna will occur from the surrounding areas within the restored lands and Mall River, following cessation of operations. Native tree planting will take place if required.

Noise and dust control will be in accordance with EPA guidelines and the OPW will implement any recommendations from Tipperary County Council.

There will be temporary Visual Impacts on views during the construction phase of the project. There will be permanent impacts associated with the addition of embankments, culverts, and walls in views from different locations around Templemore, in particular Blackcastle Road, Church Avenue, Richmond Road, The Mall, and Railway Road. The nature of these views may at times be intermittent due to intervening vegetation and buildings. Mitigation is proposed to limit any impacts.

Social and travel patterns, pedestrian or otherwise will temporarily be impacted during specific phases of the culvert construction, specifically where it requires crossing of the N62 road and Church Avenue.

The proposed works may provide temporary employment temporarily for a small number of people. Indirect temporary economic benefits will also be generated as a result of the works, in terms of contracts with local hauliers, suppliers of products and services, such as fuel and oil suppliers, machinery suppliers, environmental monitoring etc. This employment will have a positive effect on the area.

### 15.2 Ecology (Terrestrial and Aquatic)

This scheme has the potential to bring permanent significant benefits to ecology through the creation of a physically and ecologically diverse new channel.

It is recognised that this scheme can be constructed while avoiding significant impacts on local ecology by adhering to the design, construction and operation phase mitigation. If the mitigation measures

detailed within Chapters 6 *Terrestrial Ecology*, 7 *Aquatic Ecology* and 9 *Water* are implemented there should be no significant residual impacts from the proposed works.

Dust impacts on adjacent habitats and fauna are expected to be minor as dust control measures will be in place.

### 15.3 Soils and Geology

Where possible excavated material will be incorporated into the embankments and final landscaping of the works area or spread locally. This will depend however on the suitability of the excavated material, and unsuitable material will be removed off site for disposal in permitted facilities. Removal of unsuitable material from site will have short term negative impacts on local traffic and noise levels. A Traffic Management Plan will be put in place to minimise impacts.

The implementation of mitigation measures will be required to ensure that the river is not impacted during the construction and operational works. No residual impacts to the soil and geology environments are foreseen during the operational phase of the proposed scheme.

### 15.4 Water

Mitigation measures are proposed in Chapters 7 and 9 to minimise impacts to water quality and aquatic ecology. It is considered that the benefits of the flood relief scheme to human beings far outweigh the temporary disruption of the flood relief works.

### 15.5 Air & Climate Change

The proposed works are likely to generate some dust emissions, especially from traffic and mechanical works. In order to ensure that no dust nuisance occurs, a series of dust control measures will be implemented. A full Traffic Management Plan and Dust Management Plan will be implemented into the Construction Environmental Management Plan (CEMP) in order to minimise such emissions as a result of the construction phase of the development. This will be generated specifically for the development when detailed design is completed. It is not anticipated that there will be any significant impacts from dust following completion of the works.

### 15.6 Noise & Vibration

Noise will emanate from construction machinery employed throughout the works and from vehicular movements to and from the site. This has the potential to temporarily interact with ecology in terms of faunal impact. It is predicted that the proposed scheme as designed, inclusive of the mitigation measures described in this report, will not have a significant noise and vibration impact on sensitive receptors or local ecology.

### 15.7 Traffic

Traffic generated during the construction phase will slightly increase noise and vibration levels for a very short term in the locality of the works. A full Traffic Management Plan will be put in place to minimise impacts including limiting dust levels. Short term temporary diversions will be required on the N62 and Church Avenue in order to construct the culvert crossings at these roads. Road markings and road signage, located at the works access junction, will be included as part of the associated development works. These measures will ensure that road safety for all road users is maintained.

### 15.8 Landscape & Visual Assessment

The implementation of the flood defence measures will have numerous impacts on the current landscape of Templemore both at a construction phase and after works are complete. The series of proposed embankments to both the north and south of the town will not only change the local topography of the area concerned, but will also interact with local ecology as some trees and mature hedgerows will have to be removed. However, replacement of this removed vegetation will greatly reduce landscape impact in the long term.

There is also the potential for landscape changes to interact with human beings as a result of increased traffic in the area during construction and some of the proposed features of the scheme being visual. However the overall landscape change as a result of the proposed scheme is not considered significant, considering the underlying context of an urban and agricultural landscape which undergoes change over time.

### 15.9 Cultural Heritage & Archaeological Heritage

No listed buildings are located within the proposed works boundary. Following mitigation there will be no direct physical impacts on the upstanding remains of any known archaeological monuments by the development of the proposed scheme. However there is potential that a previously unknown site identified during the walkover survey, along with archaeological deposits in the vicinity of known archaeological monuments or in areas of high archaeological potential may be encountered during the excavation for the proposed development. Following mitigation these will be dealt with in accordance with best practice and in full consultation with the National Monuments Service of the DAHG and the National Museum of Ireland. As the scheme will be subsurface during its operational phase, the impact on the landscape setting of the cultural heritage sites will be negligible.

### 15.10 Conclusions

While there is potential for the above impacts to interact and result in a cumulative impact, it is unlikely that any of these cumulative impacts will result in significant environmental degradation.

It should be noted that throughout the EIS potential interaction between various environmental criteria are discussed. The baseline assessment for this project has been completed in advance of the final construction plan for these works. The impact and mitigation measures proposed are designed to further ameliorate the impact of the proposed works on the wider environment.



## 16 ABBREVIATIONS

AADT	Annual Average Daily Traffic
ACA	Architectural Conservation Area
Bgl	Below ground level
BS	British Standards
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CPUE	Catch per unit effort
CSO	Central Statistics Office
DAHG	Department of Arts, Heritage and Gaeltacht
dB	Decibel
DEFRA	Department of Environment, Food & Rural Affairs
DoECLG	Department of Environment, Community and Local Government
DoEHLG	Department of the Environment, Heritage and Local Government
EC	European Commission
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
EPA	Environmental Protection Agency
EU	European Union
GSI	Geological Survey of Ireland
ha	Hectares
HGV	Heavy Good Vehicles
IFI	Inland Fisheries Ireland
IGI	Institute of Geologist of Ireland
KM	Kilometre
M	Metres
M/s	Metres/second
mm	Millimetres
mm/s	Millimetres/second
NBDC	National Biodiversity Data Centre
NHA	National Heritage Area
NIAH	National Inventory of Architectural Heritage
NPWS	National Parks and Wildlife Services
NRA	National Roads Authority
NSL	Noise Sensitive Location
NTS	Non- Technical Summary
OD	Ordnance Datum
OPW	Office of Public Works
OSI	Ordnance Survey Ireland
pNHA	proposed Natural Heritage Areas
PPV	Peak Particle Velocity
QNHS	Quarterly National Household Survey
RBD	River Basin Districts
RMP	Record of Monuments and Places
RPS	Record of Protected Structures
SAC	Special Area of Conservation
SERBD	South Eastern River Basin District
WFD	Water Framework Directive



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