Arklow Flood Relief Scheme

Screening Statement for Appropriate Assessment and Natura Impact Statement

2021

OPW Oifig na nOibreacha Poiblí Office of Public Works

WICKLOW
ENDLESS OPPORTUNITIES

AQUAFACT

Arklow Flood Relief Scheme

Screening Statement for Appropriate Assessment and Natura Impact Statement

Produced by

AQUAFACT International Services Ltd

On behalf of

Wicklow County Council and Office of Public Works

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1. Introduction

Wicklow County Council (WCC), funded by The Office of Public Works (OPW), proposes to undertake engineering works along the Avoca River to mitigate the risk of flooding in Arklow in County Wicklow. The proposed development is collectively referred to as the Arklow Flood Relief Scheme (FRS) in the planning documentation. This *Screening Statement for Appropriate Assessment and Natura Impact Statement* (*Screening Statement for AA and NIS*) has been prepared to provide competent authorities the relevant information of the Arklow FRS (referred to herein as the proposed development) to carry out Appropriate Assessment (AA) as required under Part XAB of the Planning and Development Act 2000 (as amended).

This *Screening Statement for AA and NIS* accompanies the Arklow FRS Environmental Impact Assessment Report (EIAR) and other documentation prepared by Arup and Byrne Looby on behalf of Wicklow County Council for the proposed development.

The proposed development is being undertaken for the purpose of preventing the periodical localised flooding of lands and properties in the Arklow area. The proposed development will involve the construction of flood defences and an embankment, as well as conveyance improvements in the Avoca River; including deepening of the river channel, the introduction of new debris and gravel traps and strengthening works to the existing quay walls and Arklow Bridge. A new public realm scheme has been included along the south bank of the river. Future maintenance of the Arklow Flood Relief Scheme will also be carried out. A detailed description of the development is presented in **Section 2.2**.

The overall layout (refer to drawing no 1002) of the proposed development is shown in **Figure 1-1**.

The scheme drawings including the flood defence drawings and the landscape and public realm drawings are both included in the planning application documentation and should be referred to in parallel with this report.

A1

FROM OS MAPS 4427-10, 4427-15, 4428-06, 4428-07.
4428-11, 4428-12, 4428-16, 4428-17, 4428-22
OSI LICENCE No. EN 0083318

APPROXIMATE EXTENT OF FLOOD EMBANKMENT

MAINTENANCE ACCESS ROAD

LINE OF EMBANKMENT

LINE OF REALIGNED DRAINAGE CHANNEL

ARKLOW MARSH

RIVERBANK EXTENSION

GRAVEL TRAP

DEBRIS TRAP

FLOOD WALL

RIVER ACCESS

AVOCA RIVER

ARKLOW BRIDGE

BRIDGE WORKS

FLOOD WALL

STORMWATER DRAINAGE

RIVERBED RAISING

IRISH SEA

DREDGING

ROOSTING PLATFORMS

STORMWATER DRAINAGE

RIVERBED RAISING

FLOOD WALL

ARKLOW TOWN

STORMWATER DRAINAGE

FLOOD WALL

GROUND RAISING

GROUND RAISING

N
W E
S

GENERAL NOTES

1. DO NOT SCALE OFF DRAWING
2. DRAWING TO BE READ IN CONJUNCTION WITH ALL OTHER DRAWINGS
3. DRAWING IS FOR INFORMATION PURPOSES ONLY, NOT FOR CONSTRUCTION

LEGEND

- SITE BOUNDARY
- DEEPENING OF BRIDGE FLOOR
- U/S & D/S DREDGE
- LINE OF FLOOD DEFENCE
- LINE OF EMBANKMENT
- EXISTING FLOOD DEFENCE WALL
- REALIGNED DRAINAGE CHANNEL
- STORMWATER DRAINAGE
- DEBRIS TRAP
- GRAVEL TRAP
- MAINTENANCE ACCESS TRACK
- PROPOSED RIVERBANK EXTENSION
- PROPOSED RIP-RAP
- LOCAL RAISING OF RIVERBED
- PROPOSED ROOSTING PLATFORM
- GROUND RAISING

Rev	Date	Description	By	Chk	App
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CLIENT
WICKLOW COUNTY COUNCIL

PROJECT
ARKLOW FLOOD RELIEF SCHEME

DRAWING TITLE
OVERALL SCHEME LAYOUT PLAN

STATUS
FOR PLANNING

Date: 02.07.18	Scale: 1:2500	Drawn: NM	Chk: KT	App: KT
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1.1. Requirement for Appropriate Assessment

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (commonly known as the Habitats Directive) is European Community legislation regarding nature conservation established to ensure biodiversity is conserved through the conservation of natural habitats and wild fauna and flora in Europe.

Under Article 6(3) and 6(4) of the Habitats Directive competent authorities are required to conduct a screening for Appropriate Assessment (AA) and, if necessary, an AA on any plan or project for which it receives an application for consent, or which the authority itself wishes to undertake or adopt.

The Habitats Directive was originally transposed into Irish law by the *European Communities (Natural Habitats) Regulations, 1997* (S.I. No. 94 of 1997). The 1997 Regulations were subsequently revoked and replaced by the *European Communities (Birds and Natural Habitats) Regulations 2011*, as amended (herein referred to as the 2011 Birds and Natural Habitats Regulations).

Under Regulation 42 of the 2011 Birds and Natural Habitats Regulations all competent authorities are required to conduct a screening for Appropriate Assessment (AA) and, if necessary, an AA on any plan or project on the foreshore for which it receives an application for consent, or which the authority itself wishes to undertake or adopt. This obligation derives from Article 6(3) of the Habitats Directive.

The AA provision of the Habitats Directive is also transposed in Ireland by Part XAB of the Planning and Development Act 2000 (as amended) in respect of land use plans and proposed developments requiring development consent.

A network of sites of conservation importance hosting habitats and species as needing to be either maintained or, where appropriate, restored to favourable conservation status have been identified by each Member State. These sites are known as European sites within the Natura 2000 network. Sites, species and habitats protected under Directive 92/43/EEC (Habitats Directive) and Directive 2009/147/EC (Birds Directive) are referred to as Natura 2000 sites. Natura 2000 sites are referred to as European sites in Part XAB of the Planning and Development Act 2000 (as amended). These terms are synonymous. European sites in Ireland that form part of the Natura 2000 network of protected sites comprise SACs designated due to their significant ecological importance for habitats and species protected under Annex I and Annex II respectively of the Habitats Directive, and SPAs designated for the protection of populations and habitats of bird species protected under the EU Birds Directive (Council Directive 2009/147/EC). Features for which SACs and SPAs are designated are called Qualifying Interests (QIs) and Special Conservation Interests (SCIs) respectively. Collectively SCIs and QIs are referred to herein as conservation features

1.1.1. Stages of the Appropriate Assessment Process

Articles 6(3) and Article 6(4) of the Habitats Directive outline the decision-making tests for considering plans and projects that may have a significant effect on a Natura 2000 site. The Department of the Environment Heritage and Local Government guidelines (DoEHLG, 2009, rev 2010) promoting a four stage process to complete the AA and outlines the issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

The four stages are summarised diagrammatically in **Figure 2-1** below, and an outline of the steps and procedures involved in completing each stage follows below. Stage 1 and Stage 2 deal with the main requirements for assessment under Article 6(3) of the Habitats Directive. Stage 3 may be part of the Article 6(3) Assessment or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

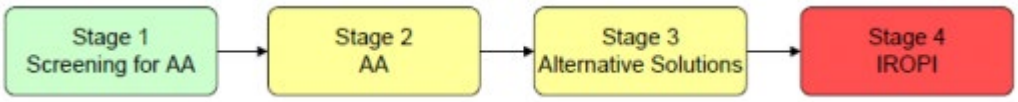

Figure 1-2: Four Stages of Appropriate Assessment

In complying with the obligations under Article 6(3) this report has been structured as a stage by stage approach as outlined below.

1.1.2. Stage 1: Screening for Appropriate Assessment

Stage I AA Screening is the process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3):

i. whether a plan or project is directly connected to or necessary for the management of European site, and
ii. whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on a European site in view of its conservation objectives.

If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA). Screening should be undertaken without the inclusion of mitigation, unless potential impacts clearly can be avoided through the modification or redesign of the plan or project, in which case the screening process is

repeated on the altered plan. The greatest level of evidence and justification will be needed in circumstances when the process ends at screening stage on grounds of no impact.

1.1.3. Stage 2: Appropriate Assessment

This stage considers whether the plan or project, alone or in combination with other projects or plans, will have adverse effects on the integrity of a European site, and includes any mitigation measures necessary to avoid, reduce or offset negative effects. The proponent of the plan or project will be required to submit a Natura Impact Statement (NIS), *i.e.* the report of a targeted professional scientific examination of the plan or project and the relevant European sites, to identify and characterise any possible implications for the site in view of the site's conservation objectives, taking account of in-combination effects. This should provide information to enable the competent authority to carry out the appropriate assessment. If the assessment is negative, *i.e.* adverse effects on the integrity of a site cannot be excluded, then the process must proceed to Stage 3, or the plan or project should be abandoned.

The AA is carried out by the Competent Authority and is supported by the NIS with input from the National Parks and Wildlife Service (NPWS) who are a statutory consultee.

1.1.4. Stage 3: Alternative Solutions

This stage examines any alternative solutions or options that could enable the plan or project to proceed without adverse effects on the integrity of a European site. The process must return to Stage 2, as any alternative proposal must be subject to a Stage 2 AA before it can be subject to the Article 6(4) test. If it can be demonstrated that all reasonable alternatives have been considered and assessed, the AA progresses to Stage 4.

1.1.5. Stage 4: Imperative Reasons of Overriding Public Interest/ Derogation

Stage 4 is the main derogation process of Article 6(4) which examines whether there are imperative reasons of overriding public interest (IROPI) for allowing a plan or project that will have adverse effects on the integrity of a European site. The extra protection measures for Annex I priority habitats come into effect when making the IROPI case. Compensatory measures must be proposed and assessed. The European Commission must be informed of the compensatory measures. Compensatory measures must be practical, implementable, likely to succeed, proportionate and enforceable.

1.2. Structure of this Report

This *Screening Statement for AA and NIS* report for the Arklow FRS has been prepared to address Article 6(3) obligations under the Habitats Directive and to inform the Screening for AA, and if deemed necessary, the AA by the competent authorities. Specifically, this report focuses on the potential *in situ* and *ex situ* effects of the proposed development on the conservation features of European sites (*i.e.* potential effects to conservation features within or away from European sites respectively).

The content of this report is as follows:

- **Section 2** Stage I Screening for Appropriate Assessment
    - **Section 2.1** Management of the European site(s)
    - **Section 2.2** Description of the Proposed Development
    - **Section 2.3** Baseline Environment
    - **Section 2.4** Characteristics of the European site(s)
    - **Section 2.5** Screening Outcome
- **Section 3** Stage 2 Appropriate Assessment - Natura Impact Statement
    - **Section 3.1** Summary of Screening Outcome
    - **Section 3.2** Description of the Proposed Development
    - **Section 3.3** Description of Receiving Environment
    - **Section 3.4** Impact Prediction
    - **Section 3.5** Potential for Adverse Effects on Site Integrity
    - **Section 3.6** Mitigation Measures
    - **Section 3.7** Plans or Projects That Might Act In-Combination
    - **Section 3.8** Outcomes and Conclusions

1.3. Guidance

This report has been prepared in accordance with the following guidance:

- EC (2018) Managing Natura 2000 sites. The provisions of Article 6 of the Habitats Directive 92/43/EEC Commission Notice (2018);
- DEHLG (2009) Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities (Revised 2010);
- Department of Arts, Heritage and the Gaeltacht – National Parks and Wildlife Service DAHG - NPWS (2012) Marine Natura Impact Statements in Ireland Special Areas of Conservation, A Working Document.

This report was informed by walk over site surveys commissioned by Wicklow County Council for the Arklow FRS and Irish Water for the Arklow Wastewater Treatment Plant (WwTP) project. The report was also informed by desk-based review of available records of protected species and habitats including the following sources:

- Conservation Status Assessment Reports, Backing Documents and Maps prepared to inform national reporting[1] required under Article 17 of the Habitats Directive (NPWS 2019);
- Site Synopsis, Conservation Objective Reports and Natura 2000 Standard Data Forms available from NPWS;
- Published and unpublished NPWS reports on protected habitats and species including Irish Wildlife Manual reports, Species Action Plans, and Conservation Management Plans; and
- Existing relevant mapping and databases *e.g.* waterbody status, species and habitat distribution *etc*. (sourced from the Environmental Protection Agency - http://gis.epa.ie/, the National Biodiversity Data Centre (NBDC) - http://maps.biodiversityireland.ie and the NPWS - http://www.npws.ie/mapsanddata/.
- Baseline desk studies and field surveys[2] carried out for the proposed development.

1.4. Statement of Authority

This report has been prepared by Dr Brendan O'Connor (BSc PhD MCIEEM) and Dr James Forde (BSc MSc PhD MCIEEM).

Brendan O'Connor is the ecology lead for the overall Arklow FRS development and has responsibility for all ecological surveys and reporting. He is expert in ecological matters and the full spectrum of environmental assessment techniques, methodologies and statutes. Professionally, he is a member of relevant Institutes requiring the highest standards of professional competence and integrity. He is a member of the Chartered Institute of Ecology and Environmental Management (CIEEM).

Brendan has 40 years of experience in the field of marine science and has published *c.* 75 scientific papers and numerous reports specialising in the biology and ecology of sea-floor communities. Brendan is an internationally recognised polychaete taxonomist and has led numerous international workshops in polychaete taxonomy including workshops as part of the UK BEQUALM/NMBAQC. He

[1] The most recent Article 17 report *The Status of EU Protected Habitats and Species in Ireland 2019* is available at https://www.npws.ie/publications/article-17-reports/article-17-reports-2019

[2] Baseline desk studies and field surveys are described in detail in the Biodiversity Chapter of the Arklow FRS EIAR which is included in **Appendix 2**.

has 33 publications on marine invertebrate taxa including descriptions of new species, revisions of families and additions to the European and Irish fauna.

As Managing Director of AQUAFACT Brendan has been responsible for all aspects of management including the design, execution and reporting of numerous desk studies, surveys, assessments and environmental outputs including NIS, AA screening and EIARs.

James has a PhD in Marine Ecology and is a full member of the CIEEM. James has over fifteen years' experience in marine research and environmental consultancy. James specialises in marine ecology and has a full appreciation of the objectives and mechanisms of national and international environmental legislation and policy.

James' academic research has focused on benthic habitats and communities, and techniques used to assess ecological impacts under European environmental legislation including the Habitats Directive and the Water Framework Directive.

As part of James' consultancy work he has delivered assessment reports to meet the provisions of the Habitats Directive and EIA Directive to accompany planning applications for a wide range of developments including pier enhancement projects, coastal defence projects, aquaculture. Of particular relevance to the Arklow FRS is James' specialist input on biodiversity for the Dunkellin River and Aggard Stream FRS, and for the proposed Galway City FRS.

James formed part of the technical advisory team for the national implementation of the Marine Strategy Framework Directive (MSFD). James was responsible for specialist input on biodiversity.

James was a member of the International Union for Conservation of Nature (IUCN) expert working group for marine red-list habitats for the North Atlantic and has collaborated with international experts on the designation of sensitive marine habitats including *Ostrea edulis* beds, *Mytilus edulis* beds, seagrass meadows and, offshore biogenic and geogenic reef habitats.

James has collaborated with national experts on the assessment of deep-water reef habitats in Irish waters to support Ireland's national assessment of reef as required under Article 17 of the Habitats Directive. Recently James has also worked with national experts on the classification of lagoon habitats, a Habitats Directive Annex I priority habitat.

2. Stage 1 Screening for Appropriate Assessment

2.1. Management of European Site(s)

The obligation to undertake AA under the Part XAB of the Planning and Development Act 2000 and the 2011 Birds and Natural Habitats Regulations derives from Article 6(3) and 6(4) of the Habitats Directive. Regulation 42 (1) of the Regulations requires that:

> *A screening for Appropriate Assessment of a plan or project for which an application for consent is received, or which a public authority wishes to undertake or adopt, and which is not directly connected with or necessary to the management of the site as a European Site, shall be carried out by the public authority to assess, in view of best scientific knowledge and in view of the conservation objectives of the site, if that plan or project, individually or in combination with other plans or projects is likely to have a significant effect on the European site*.

The proposed Arklow FRS development is not associated with the 'management' of European sites within the Natura 2000 Network having regard to Article 6 of the Habitats Directive, and as such it is appropriate that the proposed development is subject to a screening for AA.

This screening exercise investigates, in view of best scientific knowledge, whether the proposed project, individually or in combination with other plans and projects, would be likely to have a significant effect on European sites.

As outlined in **Section 1.1**, the *Screening Statement for AA* for the proposed development, which has been prepared to address Article 6(3) obligations of the Habitats Directive and associated national regulations, focuses on the potential for likely significant effects of the proposed development to European sites and conservation features. **Section 2.2** below describes the proposed development while **Section 2.3** provides a description of the baseline environment of the proposed development. The screening exercise for the proposed development for potential likely significant effects to conservation features of European sites is presented in **Section 2.4**. Where the screening exercise cannot exclude on the basis of objective information that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a conservation feature of a European site then it is necessary to carry out a stage 2 appropriate assessment (*i.e.* the conservation feature is brought forward for further consideration of potential effects in **Section 3 - Stage 2 AA - NIS**).

2.2. Description of the Proposed Development

2.2.1. Introduction

The description of the proposed development presented below is based on Chapter 4 and Chapter 5 of the Arklow FRS EIAR that was prepared by Byrne Looby Partners on behalf of Arup.

The objective of the proposed development is to provide flood relief to Arklow town, which is located approximately 63km south of Dublin, 66km north of Wexford and 23km south of Wicklow. Arklow is the southern most major town within County Wicklow and is served by the M11 National Primary Route. Arklow is situated at the mouth of the Avoca River within the Avoca Catchment. The catchment is located within the jurisdiction of Wicklow County Council and extends from north of the Sally Gap to just south of Arklow and is bounded by the Wicklow Mountains to the west. The surrounding catchments consist of the Liffey and Dargle to the north, the Vartry to the east and the Slaney to the south and west.

Key design aspects of the proposed development are summarised in **Table 2.1** below. Detailed description of the activities associated with the construction, operation and decommissioning phases of the development are respectively presented in **Section 2.2.2**, Section **2.2.3** and **Section 2.2.4**. Reference should be had to the full set of planning drawings accompanying the application for approval.

Table 2.1: Key Aspects of the Development

Project Aspect
• Works to Arklow Bridge including a) grouting of bridge piers, pier foundations and the underlying natural materials beneath formation level b) underpinning of Arklow Bridge c) Lowering of floor of Arklow Bridge (including removing the existing scour concrete slab and excavation of the existing riverbed beneath by approx. 1.4m beneath so as to lower the river bed by 1m overall) • Installation of scour protection of Arklow Bridge.
• Channel capacity improvement works comprising dredging of the river channel for 320m upstream of Arklow Bridge and 520m downstream of Arklow Bridge including removal of a sand bank west of the bridge on which gulls and other water fowl roost when the bank is exposed. Vegetated islands upstream of bridge also to be removed.
• A debris trap to be constructed upstream of Arklow Bridge to accommodate the collection and regular removal of large floating debris (fallen trees, *etc.*)
• A gravel trap to be constructed upstream of Arklow Bridge to accommodate the collection and regular removal of sediments from the river at a single controlled location
• Flood defence walls and drainage along South Bank including local alterations to the river channel along River Walk (upstream of Arklow Bridge) and South Quay (downstream of Arklow Bridge) including ○ Flood defence reinforced concrete/sheet-piled wall to be constructed upstream of Arklow Bridge on the south bank (River Walk)

Project Aspect
○ Flood defence reinforced concrete wall to be constructed downstream of Arklow Bridge on the south bank (South Quay / the Dock) ○ Installation of demountable flood barriers at a number of locations around the Dock on the south bank ○ Public realm and landscape improvements along River Walk and South Quay
• Flood defence wall and embankment and drainage along North Bank to be constructed, including ○ Flood defence earthen embankment and sheet-piled wall with concrete cap to be constructed upstream of Arklow Bridge on the north bank (east of Arklow Marsh)

2.2.2. Construction Phase

The following description of the Construction Phase of the proposed development is taken from Chapter 5 of the Arklow FRS EIAR. The Construction Phase of the proposed development comprises five Work Packages (WP):

- **WP 1**: Lowering the floor of Arklow Bridge including bridge underpinning, bridge remedial works and scour protection works. Bat tubes and bird nest boxes will also be installed under the bridge deck during and upon completion of works.
- **WP 2:** Channel dredging upstream and downstream of Arklow Bridge. Trimming of vegetation along the north bank of the river between the debris trap and Arklow Bridge. Works will include an extension of the north riverbank with planting, installation of roosting platforms upstream of Arklow Bridge and local raising of riverbed adjacent to the flood defence walls as a refuge for birds and other fauna who may use the riverbanks.
- **WP 3**: Construction of debris and gravel traps with associated maintenance access ramp. Bat tubes will also be installed on the downstream face of the debris trap piers.
- **WP 4**: Construction of flood defence walls along River Walk, South Quay and around the dock on the south (right) bank, upstream and downstream of Arklow Bridge including the adjacent stormwater drainage. Installation of bat tubes along the flood defence walls. Public realm and landscape features including footpaths, terraces, planters, lighting and seating will be constructed along the working area.
- **WP 5:** Construction of flood defence earth embankment and flood defence wall on north (left) bank along the eastern side of Arklow Town marsh including stormwater drainage diversion works. Upon completion of the earth embankment, the green space on the dry side of embankment will be planted with trees. Landscaping will be carried out on the river side of the flood defence wall.

Subject to obtaining planning approval and foreshore consent, construction of the proposed scheme is expected is expected to take approximately 54 months to complete; over a 5-year period. Works are

expected to commence in 2022 and continue to 2026. However, work will not be continuous over this period as the in-channel works are restricted to the summer months (approximately from May to September inclusive).

Subject to obtaining the relevant planning/foreshore approvals, works are expected to commence in Q2 of 2022. These works will entail some enabling works which will include underwater archaeological resolution, diversion of electricity cables in Arklow Town Marsh and archaeological resolution in the area of the proposed embankment and adjacent maintenance track. Work package 1 (WP1) is expected to commence in 2023.

Construction of the proposed development will require land take to accommodate construction activities (including site compounds) and the permanent elements of the proposed development. The planning boundary for the proposed development is shown in (see **Figure 2-1**).

Site preparatory works are required prior to undertaking activities for the WPs. These preparatory works included the establishment of construction compounds (SC1 - SC6) (see **Figure 2-2**) and establishment of river access points. The location of SC1 to SC6 and river access (RA) point are presented in **Figure 2-2**.

Each WP comprise enabling works and construction process activities. The works and activities for WP1 through WP5 are described in **Section 2.2.2.1** to **Section 2.2.2.5**.

Reference should be had to the full set of planning drawings accompanying the application for approval.

Figure 2-1: Overview of planning boundary (including working areas) required for the proposed development. Not to scale. Extracted from Figure 5.2 in Appendix 5.2 of the EIAR.

Figure 2-2: Site Compounds (SC) and River Access (RA) Locations. Not to scale. Extracted from Figure 5.2 in Appendix 5.2 of the EIAR.

2.2.2.1. Work Package 1: Bridge Underpinning, Bridge Remedial Works and Scour Protection

2.2.2.1.1. Introduction and Overview

Arklow Bridge is a nineteen arch masonry stone bridge which spans the Avoca River in Arklow and dates from the mid-1700s. The overall span of the bridge is approximately 152m while the spans of the individual arches vary from 4.55m to 6.97m.

The original width of the bridge was approximately 6.52m but the bridge was widened on the upstream side to 11.33m in the early 1960s. The widened section of the bridge is supported on three columns adjacent to each pier. The widths of the piers are typical 1.5m to 1.9m except for the central pier which is approximately 10m wide.

It is proposed to lower the floor of Arklow Bridge by 1.0m which, along with associated upstream and downstream river dredging, will increase the conveyance through the bridge and hence, reduce flood

levels upstream of the bridge. The lowering of the floor of the bridge will require underpinning of the bridge abutments and piers and the reconstruction of the scour protection slab at the new riverbed level. Minor defects have been identified on the older bridge as described below. Vegetation is growing on the bridge. This may lead to deterioration of the masonry joints in the bridge over time. Refer to **Photograph 1** below.

Photograph 1 - Vegetation Growing on Arklow Bridge

The arches of the masonry bridge were previously coated with a cementitious material – probably through guniting or shotcreting. This coating has hairline cracks and more serious cracks in places. Refer to **Photograph 2**.

Photograph 2 – Cracking of Bridge Soffit Repairs

The mortar joints of the old masonry work have deteriorated significantly in places with loss of mortar. This could lead to further deterioration if not addressed. Examples can be seen in **Photograph 3**.

Photograph 3 – Masonry Joint Defects

2.2.2.1.2. Working Area and Access Locations

Reference should be had to the full set of planning drawings accompanying the application for approval. The proposed works are shown on Drawing numbers **1004** to **1010** included in the planning application documentation. The working area (WA) 1 associated with the bridge works is shown in **Figure 2-3**.

Dedicated construction access to the Avoca River for the bridge works would be required at four locations as described below:

- River Access (RA) 1 – North Quay upstream of the bridge; access from the roundabout at Ferrybank/North Quay junction.
- RA2 – North Quay downstream of the bridge; access from North Quay.
- RA6 – South Quay upstream of the bridge; access from Main Street via Condren's Lane and River Walk.
- RA7 – South Quay downstream of the bridge at the location of the partly damaged/unused slipway; access from South Quay.

Figure 2-3: Working Area (WA1) for WP1 and River Access (RA) Locations. Not to scale. Extracted from Figure 5.8 in Appendix 5.2 of the EIAR.

2.2.2.1.3. Enabling Works

Temporary enabling works will be required to facilitate the construction of the permanent works which are part of WP1. These are described as follows:

i. River and Site Compound Access Locations:

Temporary access to the Avoca River will include demolition of existing kerbs, clearing and grubbing the existing surfaces, placing and compaction of suitable hardcore material to form ramps from the public roads. Minor works will be required for the establishment of the entrances to the site compounds and the river access locations. The contractor will be required to carry out the following works:

- Removal of existing kerbs, paving and small amounts of excavation prior to replacement of paving and realigned kerbs

- Temporary relocation of existing pedestrian footpaths and pedestrian crossings
- Establishment of traffic calming measures
- Relocation and/or protection of utilities and services including sewers, public lighting and overhead cables.
- Water level monitoring equipment will be removed for the duration of the works and reinstalled on completion.
- Protection of ESB Sub-station, charging points and mini-pillars along River Walk
- Establishment of site entrance barriers and hoarding
- Relocation of affected parking bays along South Quay and River Walk.

ii. *Construction of in-channel access roads:*

Construction access roads within the river channel will be formed to run from the river access points to the bridge work areas. These may be located wholly or partially on top of the bunds to reduce the impact on the work area. Access roads will be approximately 4m wide where it meets the public road, it will be constructed of protective material on its outer layer for suitable protection/ containment of the road edge to prevent scouring from the river. This will allow sufficient space for trucks to stop and allow water to drain from excavated material before the trucks enter the public road. The access roads will be located so as to allow sufficient working space around the permanent works and will be 500mm above high tide level.

Existing inert river gravels, from within the footprint of the designated work area, will be used where available to form the in-channel access roads. This will be supplemented with imported clean hardcore when required. All machinery will be cleaned prior to entering the river and will be monitored for leakages or spills as highlighted in **Appendix 4 CEMP**.

During these works, the contractor will monitor water level and maintain the in-channel access roads on a regular basis. Flow through the bridge arches will be maintained, and the contractor will remove any restrictions and /or debris encountered.

iii. *Bunding around the bridge for grouting and underpinning, demolition of existing scour protection and construction of new scour protection:*

Bunds will be required to isolate work areas from the river and from high tides. These will generally be formed from impermeable material or permeable material with an impermeable liner such as heavy-duty polythene. Any imported material will be clean and free of any contaminants.

The bunds will be high enough to prevent overtopping during mean high tides. Where existing river gravels are used in the bund construction, archaeological monitoring will be in place. The bunded area will be sufficient to allow works to be carried out over approximately one third of the bridge length in any one summer season with the bunded area progressing from south to north. Works for the southern third of the bridge will be accessed from the south bank while works for the middle and northern thirds will be accessed from the northern bank. This will allow river flows to continue along the remainder of the river channel and bridge. The structural integrity of the bunds will be checked and inspected on a regular basis.

Upon completion of the underpinning for each phase stated above, demolition of the existing scour protection will be carried out through concrete breaking measures, typically pneumatic & hydraulic breakers. Noise and vibrations will be monitored during this period. Broken concrete and estuarine material will be collected via excavators onto dump trucks and transferred to a suitable disposal facility.

Dewatering during installation of bunds:

Bunds will be installed on a suitable formation. The water within the bund will be electro-fished to ensure all fish are removed and released into the Avoca River in advance of dewatering. Dewatering will typically be achieved by using a series of sumps and submersible pumps. Discharge from the dewatering process will be passed to a suitably sized propriety sediment removal system located within the bund before discharge to the Avoca River. The diesel pumps and settlement tanks will be located within bunded areas as and when required. Refer to **Photograph 4** for a typical sediment removal system.

Any disturbance of riverbed materials, for reuse in the bunds, will be monitored by a licensed archaeologist. Otherwise, clean, hardcore material will be imported for the purpose. The toe of the access roads will be constructed with a silt trap system to be maintained during construction.

All temporary works will be removed by excavator and dump truck at the end of each summer work period and re-established where necessary at the commencement of the following summer work period. All works impacting on sediment levels in the river will be limited to 10 hours per day to allow 14 hours over a full tidal cycle for water to be cleared. Water quality will be monitored on an on-going basis upstream and downstream of Arklow Bridge.

Photograph 4 Typical sediment control system

2.2.2.1.4. Construction Process

The Bridge will be underpinned using one of four possible methods. These are 1) traditional underpinning, 2) micro piling from riverbed level, 3) mini-piling from road (bridge deck) level or 4) reinforced concrete wall with extensive formation improvement under each pier. A combination of options may be utilised depending on the specific ground conditions found at each pier (Refer to Drawing Nos **1007-1010** included in the planning application documentation). Options 2, 3 and 4 will require a reinforced concrete wall to be constructed around the perimeter of each pier from the existing masonry stone level to the new concrete scour slab level. Four double bat tubes will be permanently installed on the upstream face of the three southern and northernmost arches upon completion of WP1.

All of the underpinning options will require grouting works as described below. The estimated overall duration of construction activities in WP1 is 36 months between Q1 2023 and the end of 2025. The construction works will be undertaken in a number of phases as follows:

1. *Grouting of bridge piers, pier foundations and the underlying natural materials beneath formation level*

   Grouting will involve the drilling of holes using an Odex system and installation of temporary steel casings to support the holes. Once the holes are drilled, grout injection will be preceded by water flushing to determine if there are any paths through to the face of the historic masonry. Flushing with water will also establish any paths that might allow grout to escape

into the water and cause a pollution incident. Any routes found will be plugged with mortar appropriate to the historic masonry.

A tube will then be installed in the hole and grout will be introduced under pressure through the tube from the bottom of the hole upwards. Grouting will be carried out from the bridge deck for the piers and areas immediately beneath the piers.

Grouting will also be carried out from riverbed level for areas adjacent to the piers below riverbed level. The grouting will be carried out to a depth of approximately 2-3m below the existing riverbed level. The grouting material will consist of cement only or a mixture of cement and bentonite, depending on the purpose of the grouting and the permeability of the material to be grouted. **Drawing 1006** included in the planning application documentation illustrates proposed grouting works at bridge piers. **Figure 2-4** illustrates proposed grouting works at bridge piers – Refer to Drawing No 1006 for details.

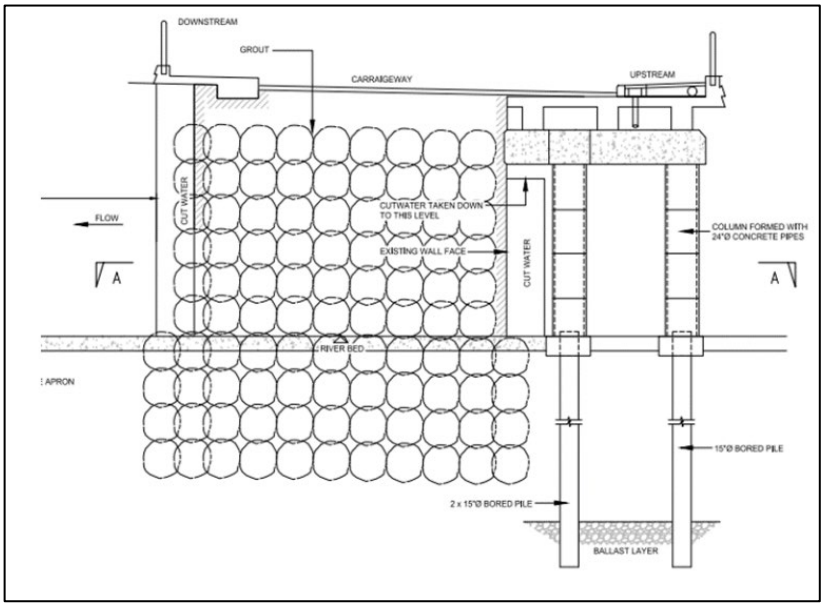

Figure 2-4: Typical Grouting works at Bridge Piers

i. Underpinning of Arklow Bridge

Four methods are set out for the underpinning of Arklow Bridge. This is to give flexibility to a contractor to select the construction methods to best suit the exact nature of the materials that are found in the bridge piers and in the formation during the grouting works. These are described below.

Option 1 - Traditional Underpinning

Traditional underpinning will comprise the removal of existing natural material below the existing formation level of each abutment and pier in a phased manner from the underside of each pier to a depth of approximately 1.5m below existing bed level and replaced with concrete. The work will be carried out from the existing bed level. Grouting will be utilised under the arches to control ground water and support the sides of the excavations.

It is expected that the underpinning will be carried out in two stages with the first stage taking a row of pins down to 800mm below existing bed level and the second stage taking a second row of pins from the underside of the first row of pins to the final formation level. The dimensions of each pin will be approximately 1.0m wide by 0.8m long by half of the pier depth (0.7m - 0.9m approximately). The depth will be limited to 0.9m for the wider central pier. Construction of pins will be staggered to avoid working adjacent to a recently constructed pin. The proposed traditional underpinning details are illustrated **Figure 2-5** and in **Drawing No. 1007** of the scheme drawings.

Option 2 - Micro-piling from Riverbed Level

Micro-piling will be carried out from riverbed level. Rotary drilling will be used to form a hole approximately 200mm diameter. Reinforcement and grout will be installed in each hole. Approximately 70no. micro-piles will be installed around the perimeter of each pier except for the larger central pier which will require up to 140 micro-piles. The top of the micro-piles will be encased in a reinforced concrete ring beam. **Figure 2-6** illustrates the micro-piling option and details of micro-piling are indicated in Drawing No. 1008 of the scheme drawings. Following the completion of the micro-piling and the lowering of the bed level, the face of the micro-piles will be clad with concrete to a depth of approximately 400mm below the new riverbed level.

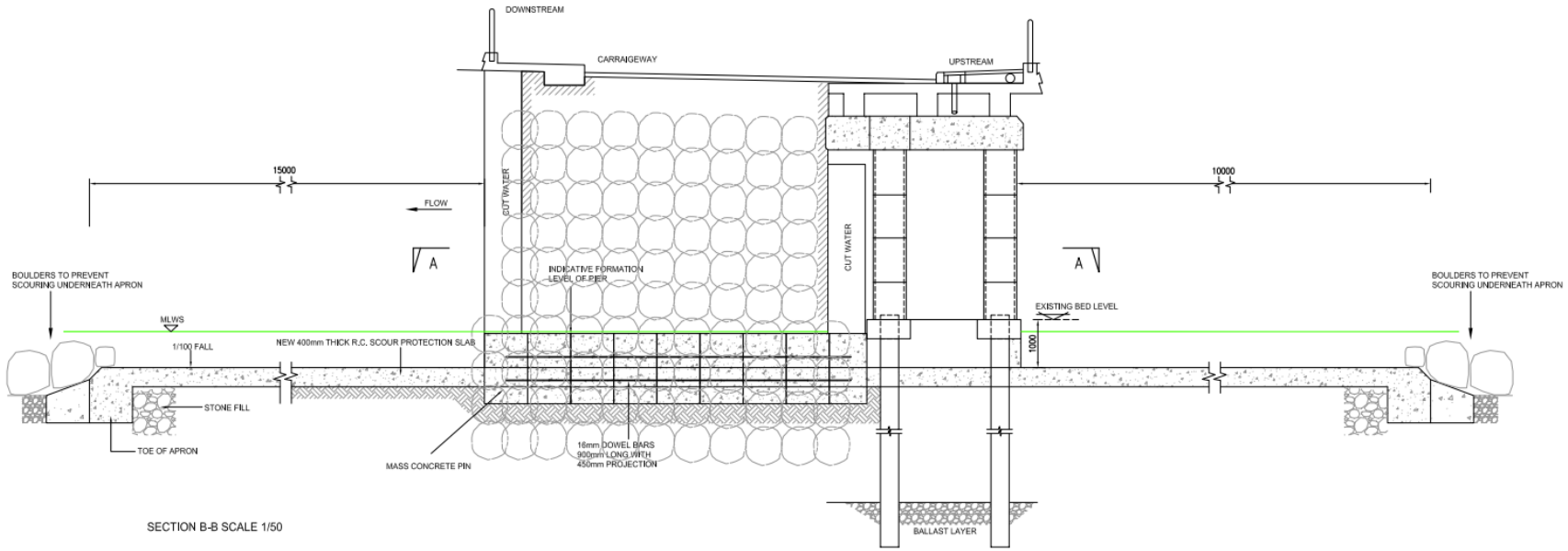

Figure 2-5: Traditional Underpinning option (Not to scale. Extracted from Drawing No 1007)

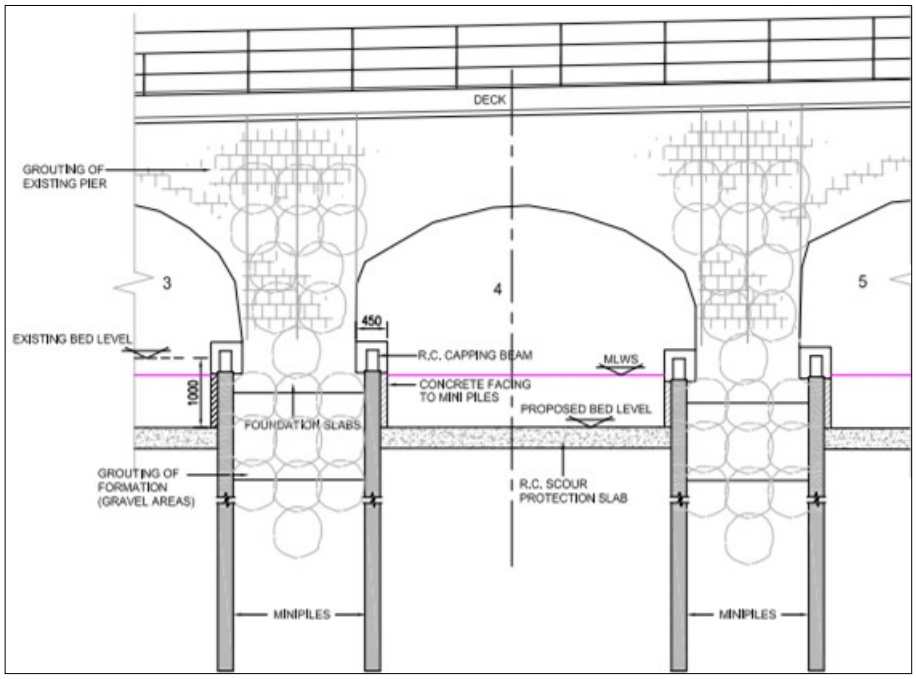

Figure 2-6: Micropiling option (Not to scale. Extracted from Drawing No 1008)

Option 3 – Mini-Piling from Bridge Deck Level:

Piling will be carried out from bridge deck (road) level. It will comprise the boring of 250mm diameter holes and the placing of reinforcement and concrete in the hole. The piles will be founded approximately 10m below existing riverbed level. Approximately 12no. piles will be constructed at each pier except for the larger central pier where approximately 24no. piles will be required.

Following the completion of the piling and the lowering of the bed level, the face of the material below pier level would be clad with concrete to a depth of approximately 400mm below the new bed level in a similar fashion to the underpinning i.e. the natural material would be excavated to a depth of 300mm from the face of the existing pier and replaced with concrete. **Figure 2-7** illustrates mini-piling of a bridge pier from deck level. Details of mini-piling are indicated in Drawing No. 1009 of the scheme drawings.

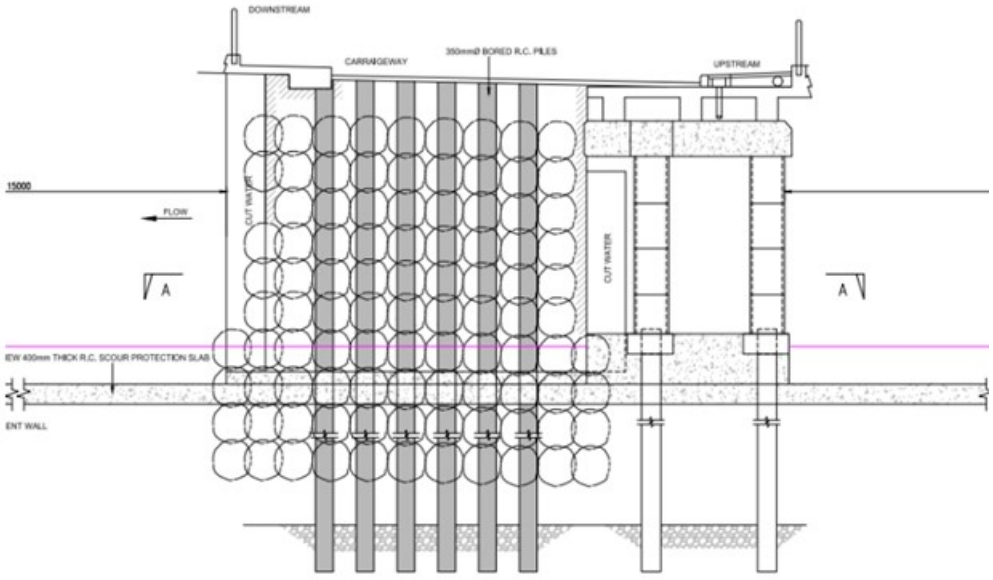

Figure 2-7: Mini-piles from bridge-deck Level (Not to scale. Extracted from Drawing No. 1009).

Option 4 – Extensive Formation Improvement

Where the soils at formation level are suitable, extensive grouting will be used to increase the bearing capacity of the pier foundations and take the load from the piers to a suitable level. The riverbed is then reduced to formation level for the concrete scour protection and a reinforced concrete (RC) wall will be constructed around the perimeter of each pier from the existing masonry stone level to 400mm below the proposed bed level. **Figure 2-8** overleaf illustrates underpinning by formation improvement and a RC wall around each pier. Details of this option are indicated in Drawing No. 1010 of the scheme drawings.

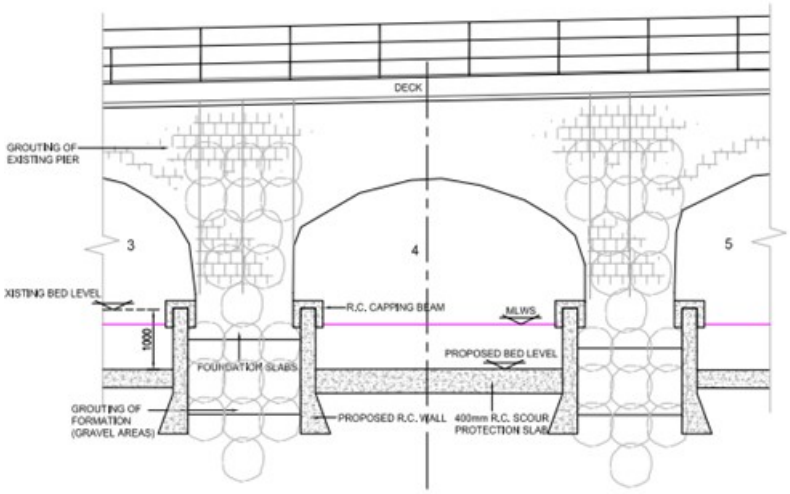

Figure 2-8: Underpinning by foundation improvement with RC wall around each pier option (Not to scale. Extracted from Drawing No. 1010).

ii. Lowering of the floor of Arklow Bridge:

Lowering of the bed level will comprise the demolition of the existing concrete slab. Demolition will be carried out in the summer periods described above through conventional breaking methods (hydraulic percussion). The contractor will monitor noise and vibration levels on the bridge and surrounding vicinity. The existing slab will be excavated including the existing riverbed to a depth of approximately 1.4m below the existing bed level. Excavated material will be transported to SC1 for archaeological examination and, subsequently, will be transported to a designated soil recovery facility, if it cannot be reused on site. The concrete waste will be transported to demolition waste recovery facility along with all other demolition material.

iii. Scour protection of Arklow Bridge:

To ensure against potential long-term effects from scour of the riverbed, suitable protection of the piers is required. A concrete scour protection slab of 400mm thickness will be constructed. The slab will have a toe (600mm deep) at the upstream and downstream extents of the slab and will be finished at the proposed bridge floor level.

Riprap will be placed along the upstream and downstream edges of the slab to prevent erosion of the natural bed material at the interface with the new concrete slab. **Figure 2-9** illustrates the scour protection detail. Details of the scour protection is indicated in Drawing Nos. 1006-1010 of the scheme drawings.

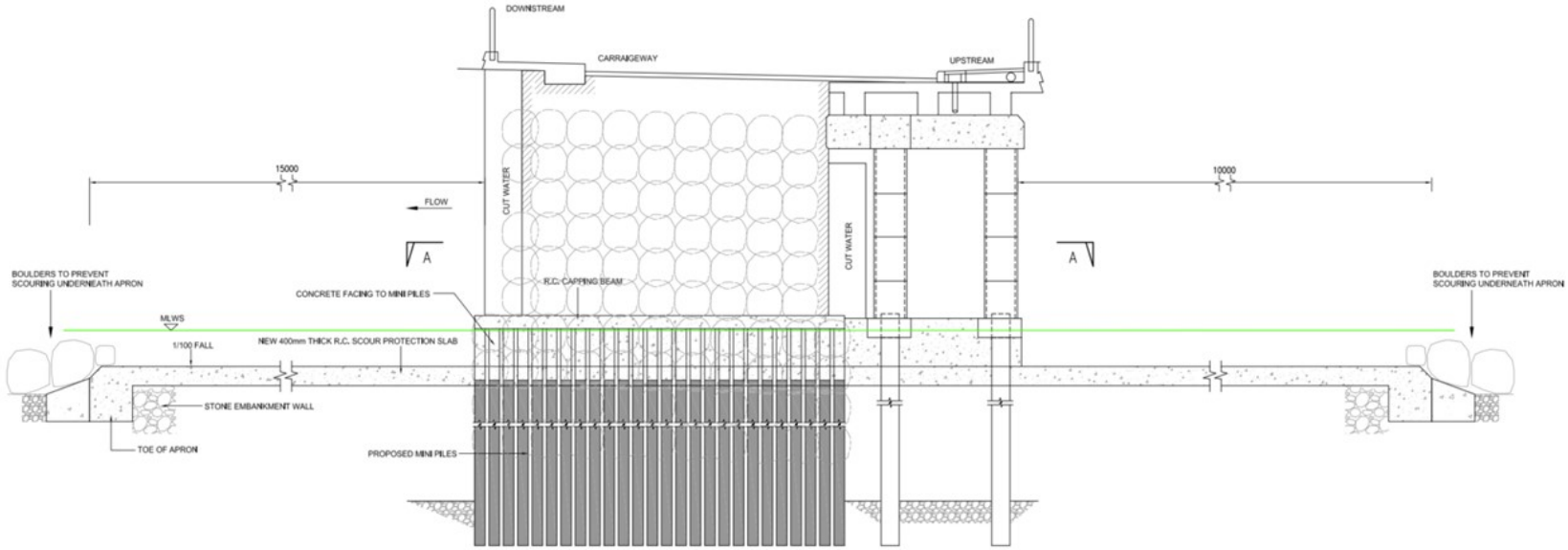

Figure 2-9: Scour Protection Detail (Not to scale. Extracted from Drawing No. 1008. Refer to Drawing Nos. 1006-1010 for details of scour protection)

iv. Remedial Works to Arklow Bridge

Works to the masonry of the historic part of Arklow Bridge will include repairs to the previously applied gunite on the soffits of the arches, repairs to the masonry of the older sections of Arklow Bridge and removal of the vegetation growing on the bridge. Defective joints will be raked out and repointed. Deeply embedded roots will be drilled and injected with a suitable herbicide, where to remove them would prove destructive to the integrity of the masonry. All loose stones will be re-seated and eroded will be mortar raked out and repointed with appropriate mortars. The render to the underside of the arches will be checked for integrity and where defective, removed and the masonry underneath repaired. Areas of render requiring repair / reinstatement will be carried out in materials more appropriate to the original stonework. Scaffolding and/or aerial work platforms (AWP) will be required to gain access to the bridge superstructure and the soffits of the bridge arches. The scaffolding will be erected from the riverbed or suspended from the bridge superstructure. The AWP will operate from the bridge deck as per the example in Photograph 5.

Photograph 5 - Aerial Mobile Platform

2.2.2.2. Work Package 2: Channel Dredging

2.2.2.2.1. Introduction and Overview

Channel dredging works are proposed to lower the level of the riverbed in the Avoca River for 320m upstream and 520m downstream of Arklow Bridge.

In general, the riverbed will be 1.0m lower at Arklow Bridge and taper to existing bed levels at the upstream and downstream extents. The dredging will extend to within 2m of the existing riverbanks or proposed river walls, as applicable. The depth of dredging will typically vary from approximately 1.2m at the channel edges to zero in the centre. Dredging at a number of high points will extend to 2.6m. The average depth of dredging will be 0.4m. The edge of the dredged areas along the north and

south banks will be protected from scour and erosion through the placement of riprap along the excavated surface.

Trees and low-lying branches that lie within the flood flow within the works area will be trimmed back to avoid impacting on flood flows and catching debris floating on the river.

During the operational stage, channel maintenance will follow a similar methodology as the capital dredging described above

An extension of the northern riverbank, adjacent to the realigned drainage channel, will be constructed as mitigation for the removal of small in-river vegetated islands in the river during dredging. Suitable trees will be planted as specified in the Landscape Design and Public Realm drawings. Three roosting platforms will be installed approximately 35m upstream of Arklow Bridge. Archaeological examination of a portion of the excavated estuarine material (dredge material) will be carried out at a number of site compounds.

The river access locations are shown in **Figure 2-10**.

2.2.2.2.2. Working Area and Access Locations

The dredging works will commence on completion of the works to underpin Arklow Bridge and the construction of the scour protection slab. Reference should be had to the full set of planning drawings accompanying the application for approvalThe proposed works are shown on **Drawing Nos. 1003** and **1010** to **1020** inclusive. The working area (WA2) for the river dredging works will comprise two distinct dredging areas as well as river access points for archaeological and temporary storage of dredge material. These are shown on **Figure 2-10**. River access for the dredging works will be as follows:

- RA1 - North bank upstream of the bridge; accessed through SC3 from the roundabout at Ferrybank/North Quay junction.
- RA2 - North bank, downstream of the bridge; accessed from North Quay. Existing hardcore material in channel at RA2 will be used to form the River Access.
- RA3 - North bank, downstream of the bridge, at the location of the existing slipway; accessed from North Quay.
- RA8 - South bank downstream of the bridge immediately downstream of the existing slipway (Tyrell's boatyard); access will be created by demolition of an existing section of wall approximately 2m downstream of existing slipway and re-built to new height as described in WP4 below.

The above river access locations will be used by the dredging contractor for access to working areas. The dredging process is described in below. Dredged material will be either 1) transported

directly off site; 2) to designated site compounds for archaeological examination and subsequently transported for reuse/disposal off site; 3) re-used for the extension of the north riverbank; or 4) transported to SC1 for reuse in the construction of the embankment and maintenance track (WP5).

Dedicated construction access will be required to the site compounds SC1 from the Dublin Road, SC2 along North Quay and Mill Road, SC5 along North Quay and SC6 along South Quay/South Beach Road.

A dredge material management study has been undertaken, the results of which are presented in Appendix 15.2 of the EIAR. The study included an interpretation of the ground conditions of the proposed dredge material which informed the dredge material management options assessment. The results of the study indicate that bulk of the proposed dredge material will comprise of inert natural sands and gravels, with a small proportion of the dredge material comprising of a surface layer of fill (silty riverbed with fill material containing anthropogenic material). The natural sands and gravels will be suitable for reuse within the scheme and/or offsite. The fill material was identified on the south bank upstream of Arklow Bridge. Some of this fill material will require disposal to a hazardous licenced facility and the remainder of the fill material will require disposal to a non-hazardous licenced landfill.

Some of the dredged material sampled downstream of Arklow Bridge had natural slightly elevated chloride concentrations, likely due to saline intrusion given the tidal influence on this section of river.

Temporary stockpiling of this material is likely to allow natural reduction in chloride concentrations sufficiently so this material could be deemed to be inert (subject to verification testing). The proposed reuse/disposal of the dredged material is further discussed in Chapter 15, Resource and Waste Management.

River access for upstream dredge works will be restricted to RA1. Downstream dredge works will be accessed via RA8, RA3 and RA2.

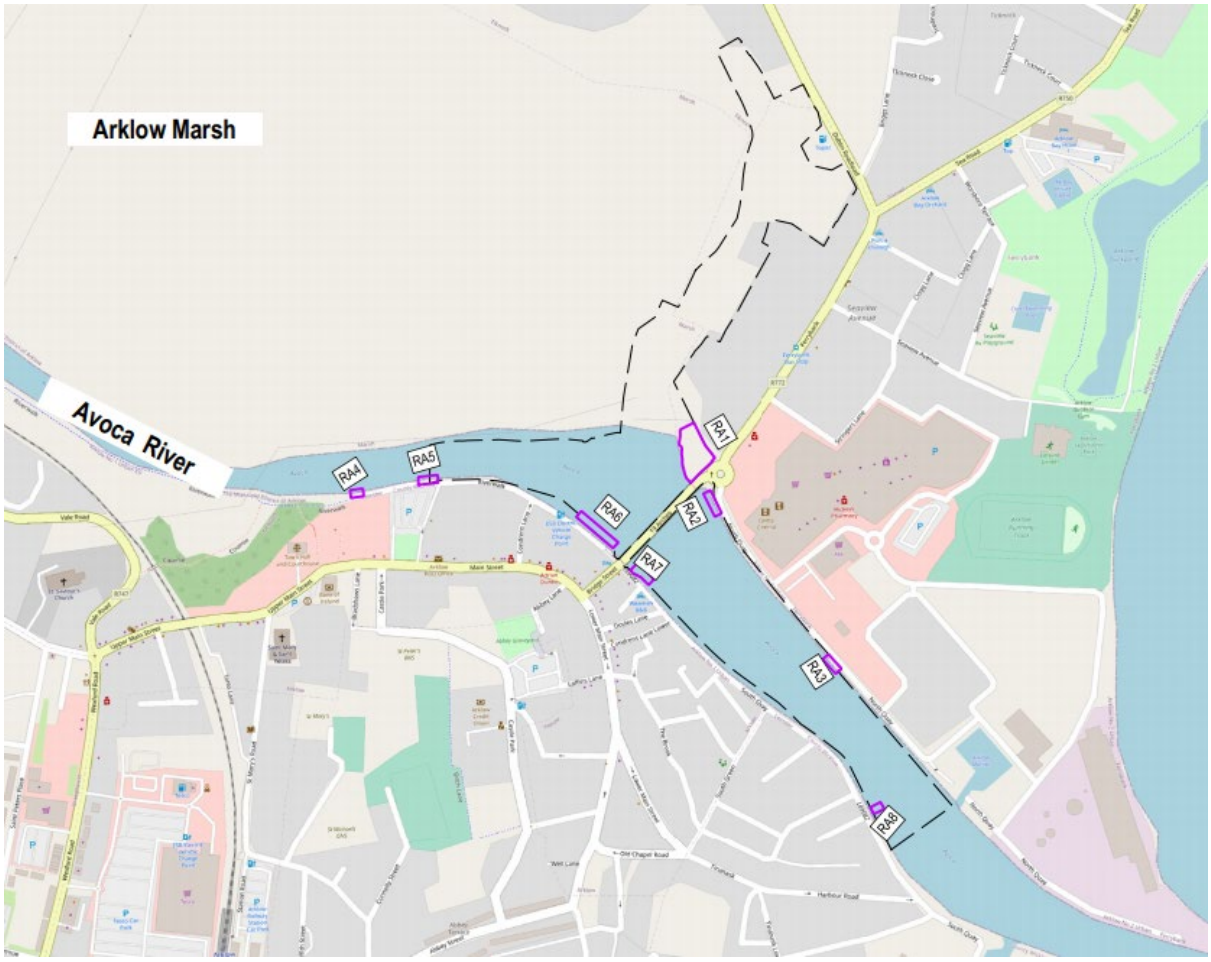

Figure 2-10: Working Area (WA2) and River Access (RA) Areas. Not to scale. Extracted from Figure 5.22 in Appendix 5.2 of the EIAR.

2.2.2.2.3. Enabling Works

Enabling works will be required to facilitate the construction of the permanent works which are part of WP2. Where possible, enabling works established as part of WP1 will be retained for WP2 e.g. RA1 and RA2. In addition, RA3 and RA8 will be used. The enabling works are described as follows:

River Water Quality Monitoring:

River water quality monitoring will be carried out for a period of twelve months in advance of the commencement of the river dredging works to establish a baseline for water quality. Parameters to be monitored will include suspended solids, dissolved oxygen, temperature, pH, turbidity and BOD_5. During the course of the dredging works, monitoring will be continued and any significant changes will be investigated. Construction practices will be adjusted if found to be having an unacceptable negative impact on water quality.

River and Site Compound Access Locations:

Temporary access to the Avoca River will include demolition of existing kerbs, clearing and grubbing the existing surfaces, placing and compaction of suitable hardcore material to form ramps from the public roads. Minor works will be required for the establishment of the entrances to the site compounds and the river access locations. The contractor will be required to carry out the following works:

Establishment of traffic calming measures.

- Temporary relocation of existing pedestrian footpaths and pedestrian crossings.
- Relocation and/or protection of utilities and services.
- Establishment of site entrance boundaries and hoarding.
- Relocation of affected parking bays along South Quay.

Construction of Temporary Haul Roads:

Temporary haul roads (minimum 4m wide) within the river channel will be constructed adjacent to both riverbanks along the extent of channel to be dredged and also across the channel by the debris trap. The temporary haul road will extend across the channel from north bank to south bank with steel/ concrete pipes installed in the haul road to convey river flow downstream. Trucks carrying dredged material will be monitored for leakages or spills as highlighted in Appendix 4 CEMP.

Existing inert river gravels from within the footprint of the designated siteworks boundary will be used where available to form the temporary haul roads. All disturbance of river gravels will be monitored by a licensed archaeologist. Otherwise, imported hardcore material will be used for the purpose. The temporary haul roads will be removed as the dredging progresses. Temporary haul road will be situated 2m away from constructed flood defence wall along River Walk.

2.2.2.2.4. Construction Process

The estimate duration of the dredging works is 5 months during Q2 and Q3 (the summer season) of 2025. The dredging work would be undertaken in the following sequence:

i. Upstream Works

The dredging works upstream of Arklow Bridge will typically involve the use of draglines for the wider sections of the river, long-reach tracked hydraulic excavators, standard-reach excavators and dump trucks.

All river access will be via RA1 (SC3) on the north bank as the flood defence walls and public realm works will have been completed along River Walk on the south bank. Dredging will progress from

downstream to upstream along the south bank and then from upstream to downstream along the north bank. Material will be excavated from the river centre line towards the riverbanks.

As the dredging adjacent to the riverbanks is completed, the geotextile membrane and riprap will be placed along the excavated face by a tracked excavator using the temporary haul road.

Inert dredged material will be loaded into the dump trucks. Water run-off from the dredged material in the trucks at SC3 is likely to contain sediment which will be prevented from running into the adjacent Avoca River by the construction of a low bund along the river edge and the diversion of any runoff to a sump from where it will be discharged through a sedimentation tank and discharged back into the river

Inert dredged material to be archaeologically tested will be delivered to SC1 or SC6. The balance of the dredged material will be transported off-site for reuse or disposal to an approved facility.

Hazardous and non-hazardous contaminated dredge material

As noted previously, a small proportion of fill material which will require removal from the riverbed during WP2 has been classified as hazardous and non-hazardous contaminated material. Locations where the hazardous and non-hazardous contaminated dredge material is anticipated (along the south bank upstream of Arklow Bridge), will be isolated at low tide level. A temporary bund made up of impermeable material, approximately 500mm above high tide level will be constructed around the location. Dewatering, following removal of any fish for visibility of the riverbed and to enable the contractor to carry out the excavation process, will be required. A conventional excavator will be used to remove any layers of contaminated material. Contaminated material will be removed to approximately 300mm below the proposed dredge level and back filled with suitable impermeable material. The finished excavated surface will be trimmed to the required line and level at the channel edge. The excavated contaminated dredge material will be transferred onto watertight trucks for transfer to SC2 for archaeological testing and monitoring or transported directly offsite.

This material will be disposed offsite to an approved hazardous licenced facility or a non-hazardous licenced landfill as appropriate.

A portion of inert dredged material will be utilised for the extension of the riverbank along the northern bank. This will be clean material placed directly from the dredging process under archaeological monitoring. Riprap will be placed around the perimeter of the area to be filled, dredged material will be placed inside the rip-rap to the required level and soil filled geotextile sacks will be placed over the dredged material. Planting can then be carried out in accordance with the landscape design – refer to Landscape Design and Public Realm Drawing Nos. 301 and 304 in scheme drawings.

Appendix 4.2. Three roosting platforms will also be installed approximately 35m upstream of Arklow Bridge as shown on Drawing No. 1003. Each platform will be anchored in position via concrete blocks and chains. Refer also to Drawing No. 301 for landscape details. Roosting platforms details are described in Chapter 10, Biodiversity (**Appendix 2** of this report).

ii. Downstream Works

Dredging downstream of Arklow Bridge is expected to be carried out by a dragline excavator for the wider sections of river channel, and by a long reach excavator sitting on a jack-up or spud barge for other areas, and where careful excavation of materials with slightly elevated chloride content is required. The barge will typically be manoeuvred by means of a tugboat. The dredged material will be loaded onto adjacent dump trucks stationed on the haul road in the river adjacent to the north and south banks of the river.

As noted previously, some of the dredged material sampled downstream of Arklow Bridge had natural slightly elevated chloride concentrations, likely due to saline intrusion given the tidal influence on this section of river. Temporary stockpiling of this material at site compounds SC1 and SC5 is likely to allow natural reduction in chloride concentrations sufficiently so this material could be deemed to be inert (subject to verification testing). This material is suitable for reuse in the embankment. The excavation methodology of this material from the river bed will be the same as for inert dredge material as described below.

Dredged material will be carted on dump trucks along the temporary haul roads towards river accesses (RA2, RA3, RA8). Surface water run-off at the river accesses, which is likely to contain sediment due to the movement of construction traffic through it to the river will be prevented from running into the adjacent Avoca River by the construction of a low bund along the river edge and the diversion of any runoff to a sump from where it will be discharged through a sedimentation tank to the river. Dredged material with slightly elevated chloride content for archaeological examination, will be transported to designated laydown areas (SC1 and SC5).

Inert dredged material for archaeological examination will be transported to a designated laydown area (SC6). The balance will be transported off site to the identified recovery facilities. Examples of backhoe excavators in operation are shown in **Figure 2-11**.

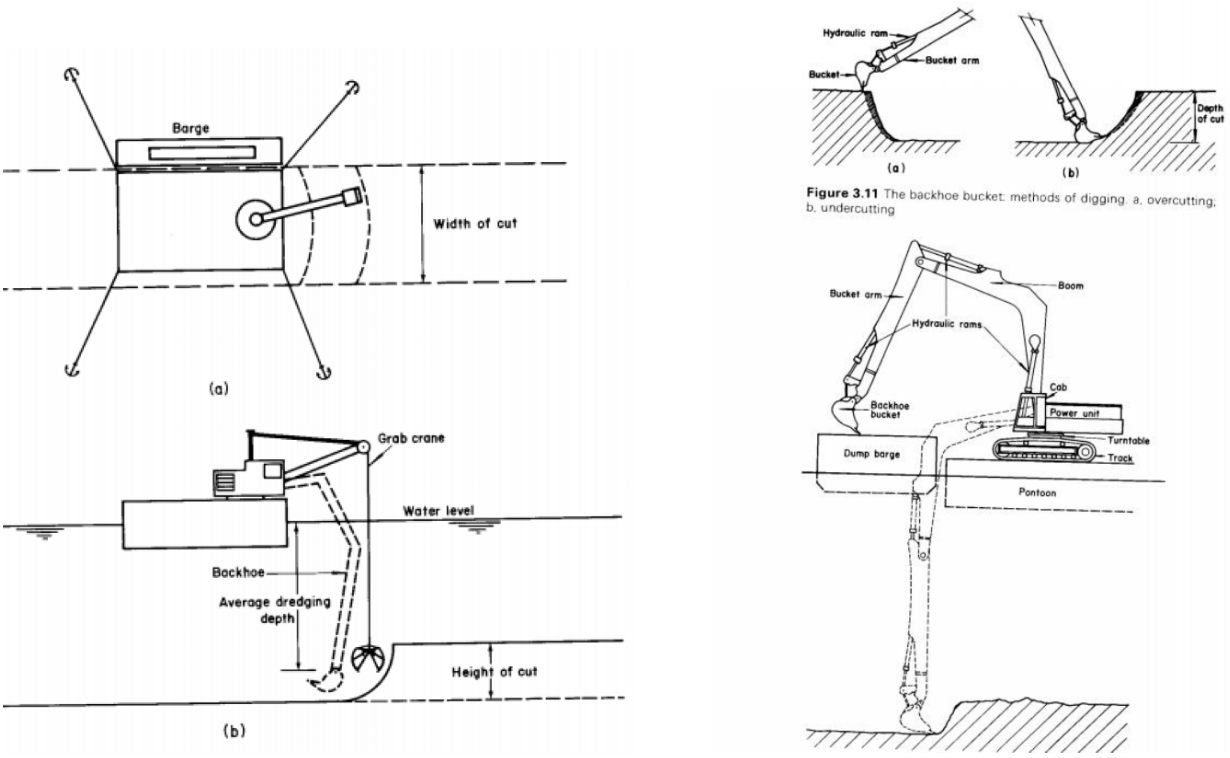

Figure 2-11: Examples of backhoe excavators dredge works. Not to scale. Extracted from Figure 5.25 in Chapter 5*, Construction Strategy.*

2.2.2.3. Work Package 3: Debris Trap and Gravel Traps

2.2.2.3.1. Introduction and Overview

The debris trap will be located approximately 340m upstream of Arklow Bridge and west of the existing river access point situated at the corner of River Walk and River Lane. It is designed to catch floating debris that could otherwise be caught in Arklow Bridge, causing blockage of flow through the bridge. It will extend from the north to the south bank of the river.

The gravel trap will be located approximately 5m upstream of the debris trap. It will generally comprise a trough formed in the riverbed and extending across the width of the river. The formed surfaces will be protected with riprap.

Both the debris trap and gravel trap will require routine maintenance from time to time and a ramp will be constructed on the southern riverbank to facilitate access to the river for this maintenance work. Reference should be had to the full set of planning drawings accompanying the application for approval. Refer to Drawing Nos. 1021 and 1022 inclusive.

2.2.2.3.2. Working Area and Access Locations

The working area (WA3) is shown in **Figure 2-12**. Access to the river will be at RA4 and RA5 which would be reached from Main Street along Condren's Lane and River Walk.

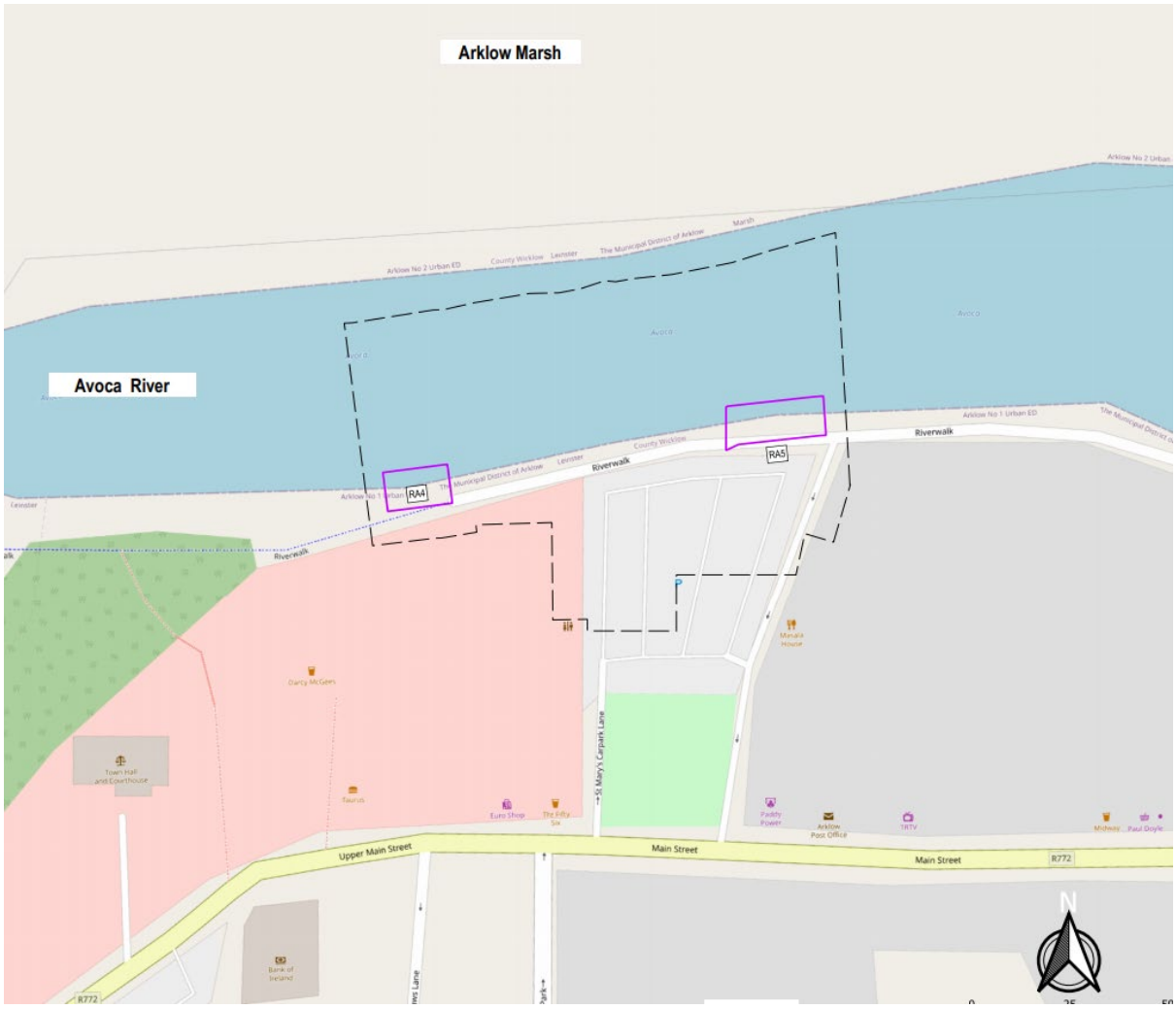

Figure 2-12: WP3 - Working Area River Access Locations and Site Compound. Not to Scale. Extracted from Figure 5.26 in Appendix 5.2 of the EIAR.

2.2.2.3.3. Enabling Works

Some trees will be removed to allow construction of the temporary access road from SC4 to River Walk and along River Walk to the RA4. These are identified in Drawing No. 300. Trees to be retained are also shown on these drawings.

A temporary haul road will be constructed from the site compound SC4 to the riverbank and on to RA4 and RA5 to facilitate construction traffic. A temporary access road will be constructed in the riverbed from RA4 downstream to the location of the debris trap and then across the river to the north bank (see Figure 2.13 below). The southern half of the construction road will incorporate suitably sized steel pipes to convey part of the river flow. Excess flow in the river will flow over the southern half of the

road. A bund (similarly as described for WP2 above) will be formed around the northern half of the debris trap to facilitate construction. On completion of the northern half of the debris trap, the bund will be removed and used to form a bund around the southern half of the debris trap. Dewatering of the bunded area will follow. On completion of the southern half of the debris trap, the material from the bund will be removed. Finally, the construction road will be removed from the gravel trap upstream to RA4.

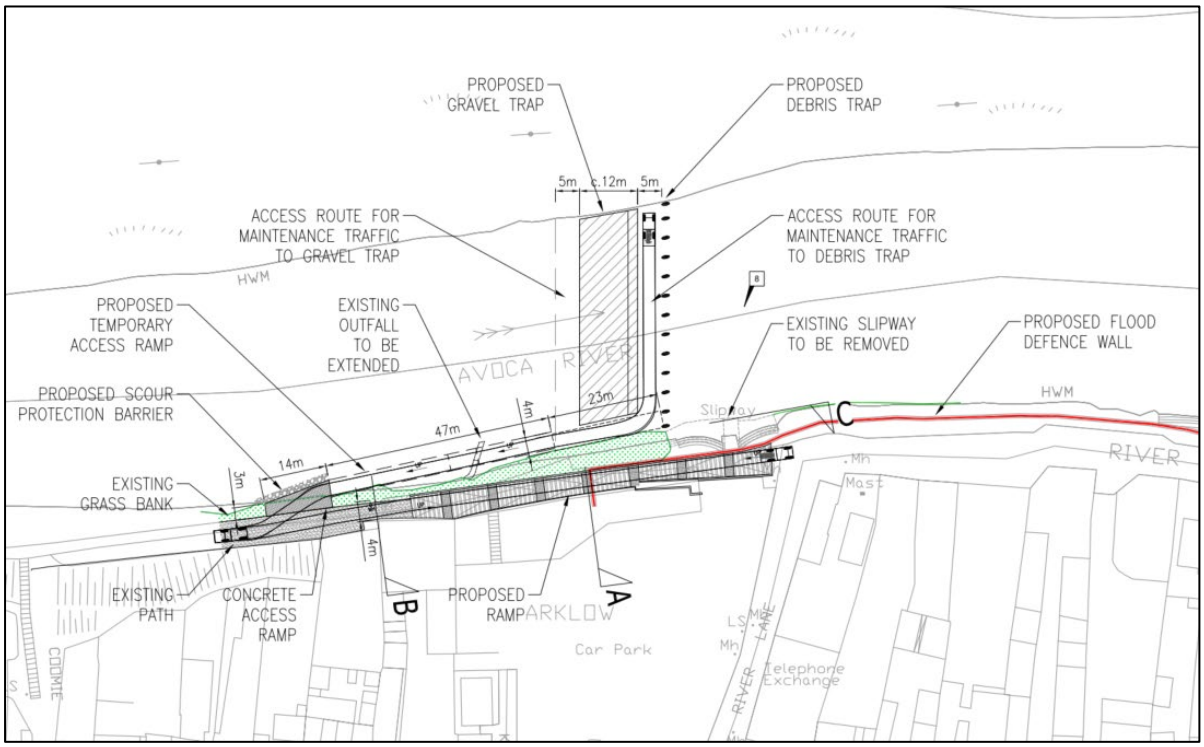

Figure 2-13: Temporary and Permanent Access road. N**ot to scale. Extracted from Drawing No. 1021**

2.2.2.3.4. Construction Process

The debris trap will be constructed of reinforced concrete (RC) columns founded at a suitable formation level and rising to 500mm above design flood level. Piling will be required to provide support to the foundations and permanent tension piles will also be required to resist overturning. Piles will be driven from bed level to formation depth for the northern half of the debris trap. The bed will then be excavated to formation level to allow for the construction of the foundation slab. The excavated material will likely comprise of natural soils comprising gravels, sands and silts. A proportion will be initially transported to SC1 for archaeological examination comprising metal detection and visual examination by a licensed archaeologist before final transportation off site.

The piles will be cut down to the foundation level. A foundation slab will be cast over the northern half of the debris trap and tie into the piers

and reinforcement cages will be fixed for each pier. Shuttering for the piers will be placed around the reinforcement and concrete poured. Finally, the shuttering will be removed. The process will be repeated for the southern half of the debris trap.

Bat tubes will be installed on downstream face of the debris trap columns above design flood level. These are indicated in Drawing No. 1021 of Scheme Drawings. Refer to Chapter 10, Biodiversity for detailed description of function and use (Appendix 2 of NIS).

Gravel Trap

- Excavation and lowering riverbed floor level by up to 1m to profile of gravel trap, working from north to south.
- Placement of riprap along the downstream and side excavated faces of the gravel trap.
- Removal of temporary access road between debris trap and gravel trap.

Finally, the permanent part of the maintenance access ramp will be constructed from reinforced concrete on the bank of the river and riprap placed along the upstream and downstream bank to prevent erosion.

2.2.2.4. Work Package 4: Flood Defence Walls and Drainage along South Bank

2.2.2.4.1. Introduction and Overview

In the 1840s stone quay walls were constructed on each side of the river channel as part of the harbour development. The river walls comprise approximately 1200 metres on the south bank and 500 metres on the north bank. The south bank walls now consist mainly of low-level stone walls with concrete facing. At the downstream end of the southern quay wall there is a high level reinforced concrete wall and sheet piled quay wall. The north bank walls also include dry stone walls but these have been replaced by reinforced concrete and sheet piled walls.

Over time, sections of the wall have undergone stabilisation works and repair which mainly comprised of the replacement of the old stone wall with a sheet piled wall, mass concrete or the placement of mass concrete along the toe of the existing wall. The maximum retained height of the walls is about 3.0m. The top of the south quay wall is at an average level of about 1.3mOD and the north is at 2.0mOD approximately.

An assessment of the quay walls was carried out in 2008 which indicated signs of distress either in the form of cracking or ground settlement behind the wall.

Construction of new flood defence walls will be undertaken upon the completion of the first phase of bridge underpinning works. Works will commence upstream of Arklow Bridge along Riverwalk for

320m. The construction of a stormwater drainage system and pump station and the section of interceptor sewer will be carried out in parallel with the wall construction.

Downstream of Arklow Bridge, works will continue for 1150m along South Quay from Arklow Bridge to Arklow docks. It will include storm water drainage system and two pump stations and the section of interceptor sewer.

Public realm works and landscaping will be carried out on completion of the structural elements of the flood defences.

The proposed interceptor sewer along River Walk and South Quay will be constructed if the flood relief scheme commences ahead of Arklow WwTP Project.

Reference should be had to the full set of planning drawings accompanying the application for approval. The proposed flood defence walls can be seen on Drawing Nos. 1031 and 1036 to 1049 inclusive in Scheme drawings. The drainage works can be seen on Drawing Nos. 1051 and 1053 to 1058 inclusive in the scheme drawings.

2.2.2.4.2. Working Area and Access Locations

The working area (WA4) are shown on **Figure 2-14**. Working Area 4 is located on along River Walk and will support the construction of the flood defence walls and drainage work from Riverwalk to Arklow Docks.

There will also be a requirement to provide temporary accesses to the site compounds SC4 and SC6 to facilitate vehicular movement as part of the enabling works.

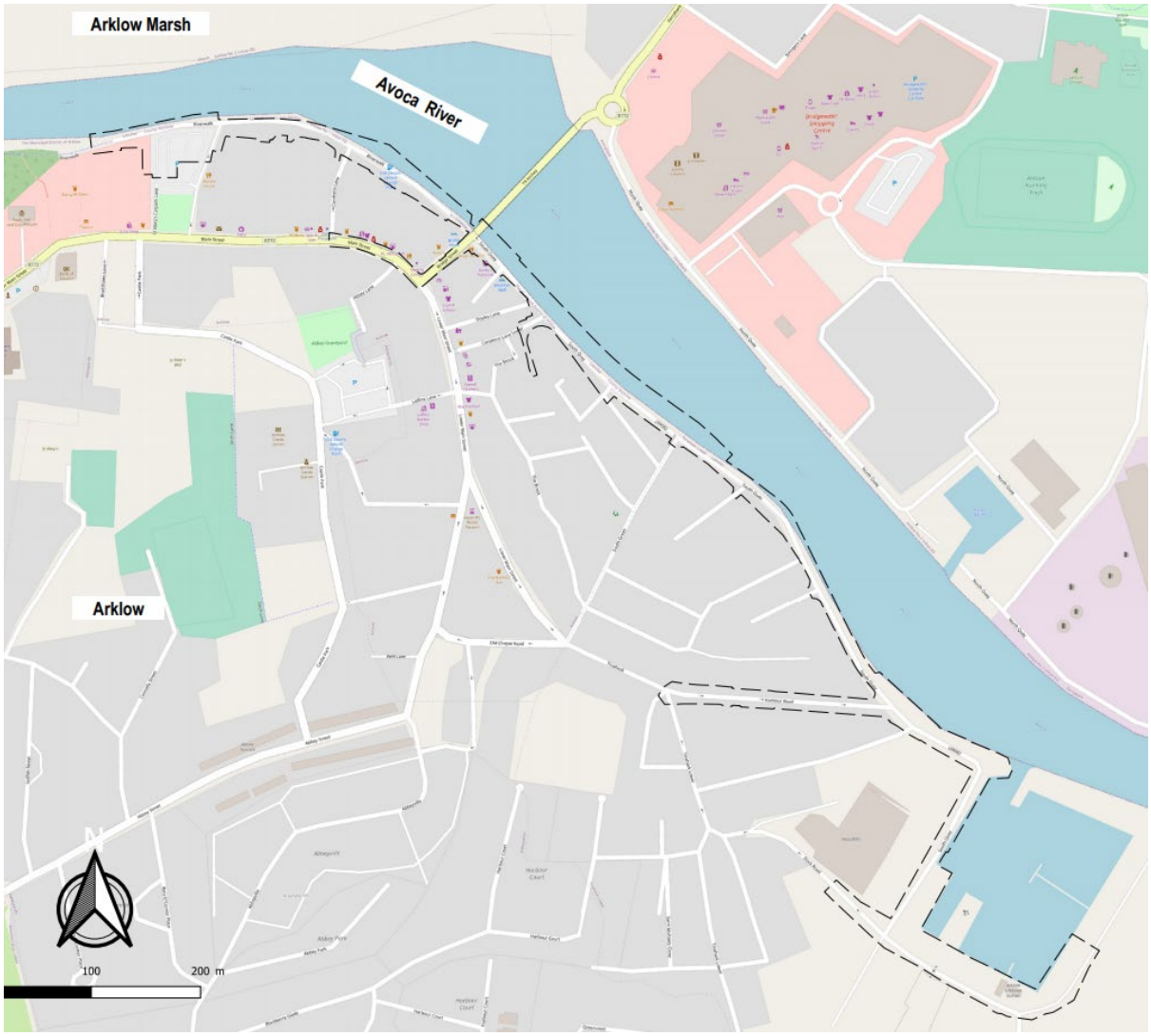

Figure 2-14: Working Area WP4 (Not to scale. Extracted from Figure 5.29 in Appendix 5.2 of the EIAR)

2.2.2.4.3. Enabling Works

Some trees will be removed to allow construction of the permanent works and provide working space along River Walk and South Quay. These are identified in Drawing Nos. 300 to 303 in the scheme drawings. Trees to be retained are also shown on these drawings.

Construction of Temporary Causeway:

To facilitate construction of the sheet piled wall along River Walk and South Quay, a temporary causeway will be required to provide a working platform for piling activities. The temporary causeway will include a sufficient working area of up to approximately 10m wide for installing manholes, drainage and sheet pile walls. Construction of the section of proposed interceptor sewer for Arklow WwTP that overlaps with the FRS working area will be included as part of the works.

The temporary causeway will be constructed from clean, suitable engineered fill (coarse granular material free from fines with a maximum particle size of 200mm) It will be required from approximately 120m upstream of Arklow Bridge to approximately 300m downstream of the bridge.

A section through the temporary causeway is illustrated in **Figure 2-15**.

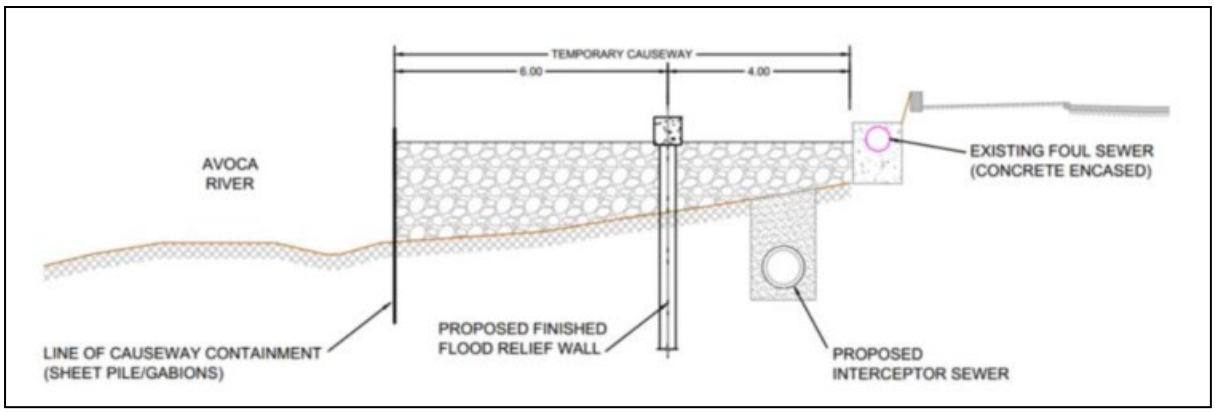

Figure 2-15: Section Through Temporary Causeway. Not to scale.

Works will commence on River Walk close to Arklow Bridge and progress upstream. River access (RA) will be from RA6, RA5 and RA4.

The causeway will be contained on the river side to mitigate against siltation migration into the Avoca River. The two most likely methods to achieve this containment will by via either be an additional row of sheet piles on the river side of the causeway or alternatively a row of stone gabions wrapped in a geotextile membrane.

The clean engineered fill material will be transported to the site using tipping vehicles. This will be used as deposit material and be tipped directly into the previously contained area of the river channel from the vehicles by means of a suitable plant. Having deposited material directly at the end of the causeway, the tipping vehicles will reverse back along the causeway in order to avoid large turning circles and double handling of material. A smaller particle size, clean engineering fill material may be used along the line of the permanent sheet piles to aid their installation.

Following the deposition of initial loads, material will be spread out to form the temporary causeway. The deposited material will be spread within the contained area using excavators. Fill material will then be compacted using tracked machines to provide a suitable running platform for subsequent lorries. The height of the causeway will be in the order of approximately 300mm above mean high water spring tide level.

The construction of the temporary causeway will continue upstream in this manner until the full route of the temporary causeway is constructed.

Following completion of the construction of the river-based flood defences and drainage (i.e. when the causeway is no longer required) along River Walk, the causeway material will be removed from the river side of the new sheet piled wall by excavator and used as fill where required on the land side of the wall. Excess material will be removed by excavator and dump truck and used for the construction of the causeway along South Quay.

The installation of a temporary causeway is considered in-stream works (i.e. within the river channel), therefore the contractor will be required to seek full approval from Inland Fisheries Ireland for all activities in the river channel prior to the commencement of works.

All temporary measures in the river channel will be required to be carried out in accordance with the Inland Fisheries Ireland guidance. The seasonal restrictions contained in the guidance (i.e. May to September inclusive) will apply to both the installation and removal of the causeway.

Standard best practice measures in accordance with the Office of Public Works (OPW) guidance will be required to be employed by the contractor to manage silt run-off and pollution control.

To provide groundwater cut off, the sheet piles will extend into the underlying cohesive deposits (which, based on the existing ground investigations data were encountered at approximately 5.2m below the existing ground level). This will be to enable foundation preparation for the interceptor sewer in channel. Once both lines of sheet piles are in place, the excavation will be dewatered and the new sewer will be laid.

Dewatering will typically be achieved by using a series of sumps and submersible pumps. To reduce the amount of dewatering required at any given time, it is likely that the contractor will construct the sewer in sections.

Discharge from the dewatering process will be passed to a suitably sized propriety sediment removal system before discharge to the Avoca River.

2.2.2.4.4. Construction Process

Upon completion of Phase 1 of bridge underpinning and remedial works, flood defence and drainage works will commence upstream and downstream of Arklow Bridge. The estimate duration of works is 23 months. The construction of the reinforced concrete flood defence walls is likely to be carried out by traditional methods comprising the following activities:

i. Construction of Sheet Piles including End Caps/ Reinforced concrete walls

In certain locations where the flood defence wall will be located within the river channel, sheet piles will form the foundation of new flood defence walls and extend from formation up to existing ground

level approximately. A temporary haul road and causeway will be required in the river to construct the sheet pile walls along River Walk and South Quay.

In these locations, the existing quay wall where it exists, will be enclosed within the new construction.

Installation of Sheet Piles including RC Wall:

The sheet pile wall will be formed by driving steel sheets into the ground and the sheet piles will be interlocked to provide continuity. The sheet piles will be steel and will be driven to the required depth using a piling hammer, vibrating hammer or similar. Once the sheet piles have been completed, the top of the sheet piles will be encased with reinforced concrete to form the top of the wall. The concrete capping will be cast from a level below the top of sheet pile level to the required flood defence level. The face of the sheet pile on the river side will be clad with in situ or precast concrete panels. A precast concrete cap will be placed along the top of the wall.

Construction of Reinforced Concrete Walls

Reinforced concrete (RC) walls will be constructed in locations where the proposed wall will be located on the riverbank or quay side. Preparation of the foundation works will include excavation to formation level, dewatering of excavation (if required), importation of select base granular material, installation of reinforcement and casting of structure.

The construction of the RC flood defence wall at the western side of the Dock will require ramps to allow access and egress over the walls for vehicular traffic.

Use of Existing Walls

At some locations along South Quay, the existing walls are suitable to be retained for flood defence walls. Minor works will be required including sealing any drainage openings through the walls.

Construction of Stormwater Drainage and Associated Works

It is proposed to construct the stormwater drainage using the open cut method upstream and downstream of Arklow Bridge. Coordination with the Arklow WwTP Scheme will be essential as the works lies on the same work area.

The stormwater drainage pipeline ranges from approximately 450mm - 750mm in diameter and invert levels are between 1.5m and 0.6m below existing ground level.

<u>Construction Process:</u>

To form the trench for the stormwater drainage, the overburden will be excavated, and a drag box or trench box will be installed as the excavation progresses. The excavation areas will be sized accordingly to accommodate the trench box/drag box.

The use of trench box/drag box will minimise the working area by providing stability to the upper sides of the excavation. Following this, the excavated material will be removed (using excavators at ground level). This process will be repeated until formation level has been reached to enable the laying of the stormwater drainage.

Due to the relatively high-water table in the area (approximately 2m below ground level), dewatering works will be required at some locations. Dewatering will typically be achieved by using a series of sumps and submersible pumps. To reduce the amount of dewatering required at any given time, it is likely that the contractor will construct the sewer in sections. Due to the nature of the weathered rock, groundwater cut off will not be possible using trench boxes and would only be achieved if temporary sheet piles are employed on either side of the trench excavation. This is thought to be an unlikely approach for the contractor.

Discharge from the dewatering process will be passed to a suitably sized propriety sediment removal system before discharge to the Avoca River.

Once the excavation is dewatered, the drainage pipe will be laid on granular bedding material and the trench will be filled with suitable fill material to near ground level. The area will subsequently be reinstated to its pre-construction condition.

Pump Stations:

The proposed scheme requires the construction of storm water drainage network with three pump stations, which will include:

An underground wet well/dry well pumping station constructed from reinforced concrete; and

A pump station kiosk which hosts the motor starters and controls system.

Details of the pumping stations are shown on Drawing Nos 1056 to 1058 inclusive in scheme drawings. In order to construct the wet well/ dry well pumping stations, it is considered that the contractor will likely use standard excavation techniques through soil, with shoring to provide stability to the sides of the excavation.

Upon completion of the excavation works, construction of the wet well/ dry well pumping station will likely be completed using standard reinforced concrete construction method including placement of reinforcement steel, shuttering and concrete pouring activities.

The pumping station will include construction of the following above ground features using standard construction techniques:

Kiosk: A reinforced concrete plinth approximately 300mm thick will be installed at ground level at each of the 3 no. kiosk locations. The plinth will be placed on a suitable sub-base and the kiosk will be fixed directly on top of the plinth. The kiosk will be approximately 1.5m high x 2.0m wide x 0.45m deep and will be a prefabricated cabinet made of either hot dipped galvanised stainless steel or GRP. The kiosk will be green in colour.

Public Realm and Landscape

Landscaping along the flood defence works will be constructed using conventional methods. Hard landscaping will be installed along the flood defence walls in the form of kerbs, roads and pathways with concrete and gravel finishes and appropriate marking and parking added. Soft landscaping in the form of the placing of soil, levelling and planting of vegetation will also be undertaken.

The proposed ground levels will tie in with the existing road levels. Green amenities, road and pedestrian walkway finishes will be installed as indicated in the Landscape Design and Public Realm Drawing (nos. 6545-301 and 6545-303).

Construction of Arklow WwTP Interceptor Sewer

This section of works physically overlaps with the proposed Arklow WwTP. The proposed interceptor sewer will be constructed along the southern bank from River Walk to South Quay. The sewer will vary in diameter from 450mm, 112m upstream of River Lane junction to 1200mm on South Quay. Refer to Drawings Nos. 1053 to 1055 inclusive in scheme drawings, for the length of the sewer to be installed.

The interceptor sewer network will not be commissioned until such a time as the WwTP is fully commissioned and accepting wastewater for treatment. The existing wastewater and stormwater network will therefore be required to be functional until the Arklow WwTP is operational.

Open cut Sewers (Land Based)

It is proposed to construct the sewer using open cut methods on the upstream, land-based section on Riverwalk (i.e. from the 112m upstream of River Lane junction to 10m upstream of Arklow Bridge). Construction activities will be carried out during Q4-Y3 till Q2-Y4(October to March) following consultation with Wicklow County Council and Irish Water.

<u>Construction Process:</u>

To form the trench for the sewer, the overburden will be excavated, and a drag box or trench box will be installed as the excavation progresses. The excavation areas will be sized accordingly to accommodate the trench box/drag box. The use of the trench box/drag box will minimise the working area by providing stability to the upper sides of the excavation. Following the excavation of the overburden, rock breaking, or rock ripping will take place. This will be achieved by percussive breaking

or rock ripping techniques. The excavated material will be removed (using excavators at ground level). This process will be repeated until formation level has been reached to enable the laying of the sewer.

A relatively high-water table is expected in the area (approximately 2m below ground level), dewatering works will be required to support the open cut construction of the sewer. Due to the nature of the weathered rock, groundwater cut off will not be possible using trench boxes and would only be achieved if temporary sheet piles are employed on either side of the trench excavation.

Upon completion of the dewatering process, the sewer will be laid on granular bedding material and the trench will be filled with suitable fill material to ground level. The area will be reinstated as per public realm and landscape details above.

Open cut Sewers (River Based)

Construction of the interceptor sewer in the river channel will be constructed upon completion of proposed flood defence wall (sheet pile installation). Locations affected include 10m upstream of Arklow Bridge to Chainage 300m downstream of Arklow Bridge along South Quay.

The sewer will be laid on granular bedding material and the trench will be filled with suitable engineered fill, free from contamination and in accordance with the relevant engineering specifications.

2.2.2.5. Work Package 5: Flood Defence Walls, Embankment and Drainage along North Bank

2.2.2.5.1. Introduction and Overview

Construction of new flood defence earthen embankment and wall will be undertaken in parallel with the river dredging works (WP2) to facilitate the reuse of some of the dredged material. Works will commence upstream of Arklow Bridge along the eastern edge of Arklow Marsh. The embankment will be constructed over 550m approximately and include the construction of a land drain at the toe of embankment on its eastern side. A sheet piled wall flood defence wall with concrete capping will be constructed from the northern abutment of Arklow Bridge over a length of 60m before interfacing with the flood defence embankment.

Other associated works include diversion of the existing channel, which connects the canal to the Avoca River, westwards to facilitate the construction of the wall and embankment and placing of riprap to protect the river bank where it is close to the proposed wall and embankment.

Reference should be had to the full set of planning drawings accompanying the application for approval. The proposed works are shown on Drawing Nos. 1031 to 1035 inclusive in the scheme drawings.

2.2.2.5.2. Working Area and Access Locations

Work Package 5 working area is located on the north bank of the river channel upstream of Arklow Bridge. The working area will support the construction of the flood defence earthen embankment and sheet piled wall from the north riverbank for 610m approximately north of the riverbank, along the eastern edge of Arklow Marsh. The working area and river access locations for work package on **Figure 2-16**.

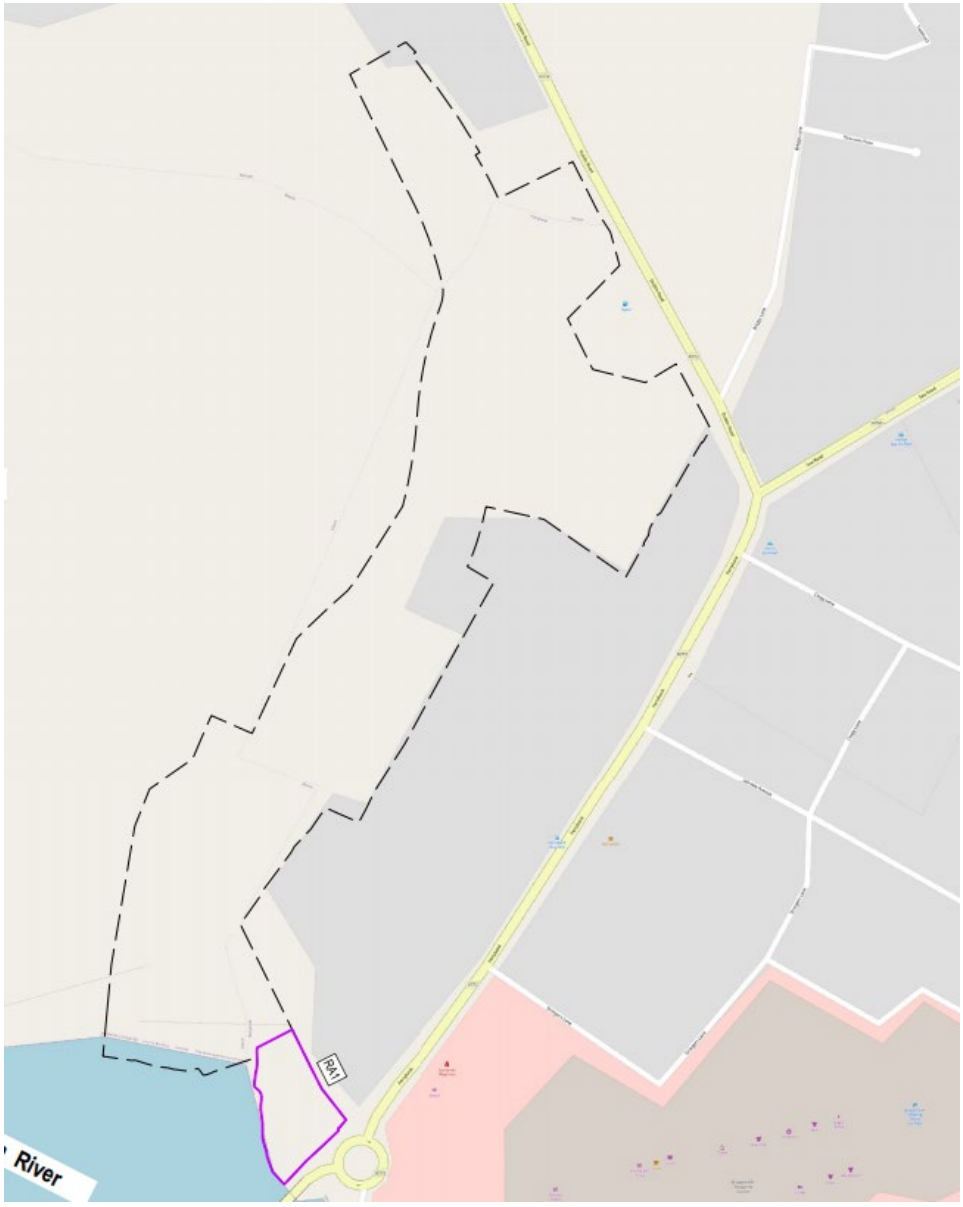

Figure 2-16: Working Area (WA5) and Site Compounds. Not to scale. Extracted from Figure 5.33 in Appendix 5.2 of the EIAR

2.2.2.5.3. Enabling Works

Diversions:

Overhead and underground electrical cables, which run from River Walk across the Avoca River to the Dublin Road and again from this line to Ferrybank, conflict with the proposed works in places. Permanent diversion of these cables will be carried out in advance of the construction works. For relocation and/or protection of utilities and services, refer to Drawing 1062 of the Scheme Drawings. These utilities and services will be repositioned and placed underground to avoid the flood embankment. There are also underground cables running from the marsh to Ferrybank which will require to be diverted. All overhead cables situated along the working area will be diverted to underground cables. These works will be carried out as advanced works in 2022 prior to commencement of the permanent works in 2023. All relocated services will be positioned to ensure that they are at a safe distance from the works.

An existing channel (canal) which conveys surface water from the west (Avoca River Park industrial Estate) towards Ferrybank will be diverted westwards towards Avoca River. Diversion of the channel will be carried out in the marsh. Excavation of the channel up to 2m depth will be carried out using excavators. Topsoil removed will be reused during the reinstatement of the riverbank at SC3. The existing channel opening will be filled during the construction of the earth embankment.

Trees:

Some trees will be removed to allow construction of the permanent works and provide working space along the west of Ferrybank. These are identified in Drawing Nos. 304 to 306 inclusive, in Scheme drawings. Trees to be retained are also shown on these drawings.

Temporary enabling works will be required to facilitate the construction of the permanent works which are part of WP5. The enabling works are described as follows:

Site Compound Access Locations:

Temporary access to the site compound SC1 from the public road will be in place from WP1. Minor works will be required for the establishment of the entrances to the site compounds. The contractor will be required to carry out the following works:

i. Removal of existing kerbs, paving and small amounts of excavation prior to replacement of paving and realigned kerbs

ii. Establishment of traffic calming measures

iii. Temporary relocation of existing pedestrian footpaths and pedestrian crossings

iv. Re-alignment of channel situated in the Marsh. Refer to Drawing Nos. 1032 to 1035 inclusive.

v. Establishment of site entrance boundaries and hoarding

A temporary haul road will be constructed along both sides of the proposed wall and embankment. The haul road will be left as a 4.0m wide maintenance track on the dry (east) side of the embankment to facilitate ongoing inspection and maintenance.

2.2.2.5.4. Construction Process

Construction of the WP5 will include an earthen embankment, sheet piled flood defence wall with concrete capping and drainage. The construction works will be undertaken as follows:

Construction of Sheet Piles with concrete capping –

Installation of Sheet Piles including Reinforced Concrete Retaining Wall:

The sheet pile wall will be formed by vibrating steel sheet piles into the ground and the sheet piles will be interlocked to provide continuity. The sheet piles will be steel and will be driven to the required depth using a piling hammer or similar.

Once the sheet pile has reached the required depth, the top of the sheet pile will be encased with reinforced concrete to the required flood defence height. See **Figure 2-17**.

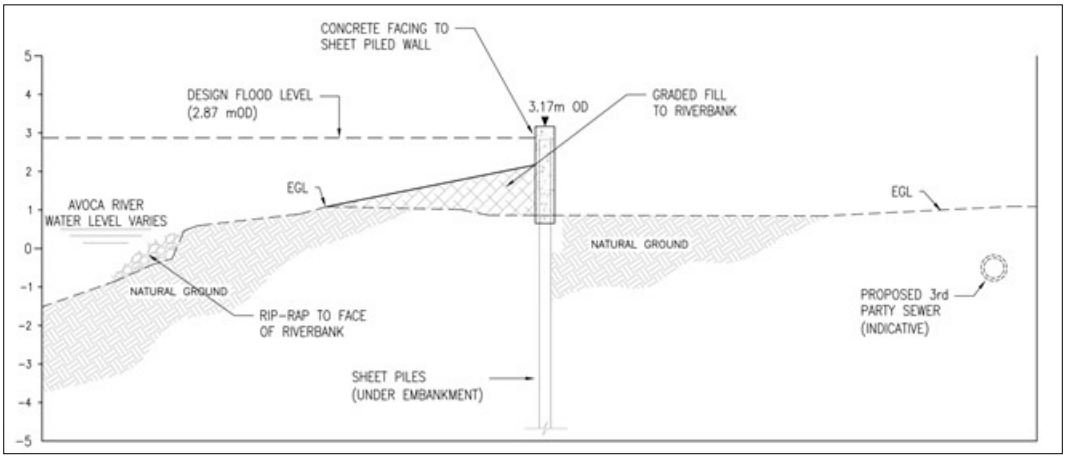

Figure 2-17: Section through sheet pile with RC cap. Not to scale.

i. Construction earth embankment

Foundation Preparations:

Foundation preparations will consist of clearing, grubbing, to remove stumps and large roots in approximately 1m, and stripping to remove sod, topsoil, boulders, organic materials, rubbish fills, and

other undesirable materials. Highly compressible soils occurring in a thin surface layer or isolated pockets will be removed.

After stripping, the foundation surface will be in a loose condition and will be compacted. Stump holes would be filled and compacted by power-driven hand tampers. If a silty or clayey foundation soil has a high water table and high degree of saturation, the surface will be compacted using lightweight compaction equipment. A geotextile membrane will be placed over the formation to strengthen the foundation and suitable dredged material will be spread over the geotextile to form a suitable surface for the remaining construction works. Sheet piles will be driven through the formation to a suitable depth to provide cut-off of surface water passing beneath the embankment from the wet (marsh) side to the dry (Ferrybank) side.

Dewatering the Working Area:

Trenches: Where cut off or drainage trenches extend below the water table, a complete dewatering will be provided to properly prepare the foundation and to compact the first lifts of embankment fill. All dewatering will be disposed through sediment settlement tanks.

Embankment Compaction:

The embankment varies in height from the Avoca River towards the Dublin Road within the marsh. Drawing 1035 of Scheme drawings illustrates the typical sectional details of the embankment. Suitable material, including the dredged material in the core and impermeable material, typically clay, surrounding the core, will be placed in layers and compacted. Compaction will be undertaken by using a tamer foot roller or sheepsfoot roller. As a rule of thumb, to obtain the required compaction effort, the following will be considered:

- All fill material for the embankment will be placed in layers no greater than 150mm thick.
- Each layer would be thoroughly compacted before the next layer is placed. A minimum of 6 passes to achieve the required compaction effort is generally required.
- The compaction effort achieved would be on average 98% Standard Maximum Dry Density (MDD) (non-structural fill).

The material forming the embankment will be placed with sufficient moisture to ensure proper compaction. The moisture content will be in the range of -1% to +3% of optimum moisture content (OMC). If the material is too dry, water will be added. If the material is too wet, it will be spread and mixed with drier material.

Before each additional 150mm lift is added to the embankment, the preceding lift will be scarified to ensure that the two lifts are properly joined.

A wheeled scraper or truck will be used to place the selected soil material (clay).

French Drain at Toe of Embankment:

The French drain will be constructed as follows:

- Excavate trench to required depth
- Line the trench with a geotextile material
- Place perforated drainage pipe over drainage granular layer
- Back fill with pea gravel and suitable dredged material

Landscaping:

Landscaping along the flood defence works will be constructed using conventional methods. Soft landscaping in the form of the placing of soil, levelling and grass-seeding will be undertaken. Permanent landscaping in the form of trees will be planted at site compound (SC1) as specified in Drawing Nos. 304 to 306 inclusive in Public Realm Drawings.

The proposed ground levels in the marsh will tie in with the existing adjacent ground levels on the east side of the embankment.

2.2.3. Operation Phase

This section describes the monitoring and periodic inspection and maintenance work that will be undertaken during the operation phase of the project. Given the scope of the maintenance operations proposed it is concluded that there will be no likely significant effects associated with the operation phase of the proposed development.

2.2.3.1. Maintenance and Monitoring

Requirements

Over time, natural processes will change some aspects of the proposed development as follows:

- vegetation will continue to grow along the river banks below the design flood level;
- floating debris including trees and branches will be carried down river during flood events;
- hydrogeomorphological processes in the Avoca River will continue and result in the continuing transport of sediment down river;
- sediment resulting from surface water runoff will settle in the pump sumps and drains;
- wear and tear on the electrical and mechanical components of the pumping station.

Consequently, regular maintenance activities will be required for the following elements of the Scheme:

- riverbank vegetation will be trimmed back so that it does not lie within the design flood flow;
- gravel and debris traps will be inspected annually and any gravel deposition or debris will be removed;
- the river channel will be inspected regularly and maintenance dredging carried out at any locations of deposition, estimated at ten year cycles;
- the stormwater drains will be inspected and cleaned as required;
- the stormwater pumping stations and non-return valves will be inspected annually and maintained as required to ensure that they remain in proper working order.

In addition, regular inspection will be carried out on all other elements of the Scheme including:

- Demountable flood defence barriers.
- Flood defence walls including glass panels.
- Flood defence embankment.
- Bridge piers and abutments.
- Scour protection slab.
- Public Realm.
- Water safety equipment.
- Roosting platforms for birds upstream of Arklow Bridge.
- Bat tubes in the flood defence walls, debris trap piers and on Arklow Bridge.
- Nest boxes on Arklow Bridge.

Maintenance and repair will be carried out on the above listed items as necessary.

Stormwater Drainage System

The stormwater pumps will be electrically operated with provision for connection to a mobile generator as a back-up option. Use of the pumping stations will be very infrequent, averaging less than once in five years and as such, emissions will be insignificant. The stormwater pumping stations will require routine and non-routine maintenance of all mechanical, electrical and control equipment. Typically, six-monthly inspections will be carried out to ensure all equipment is functioning as intended and in particular, that pumps are operating properly. There will be no waste expected from these maintenance events. A telemetry system will monitor the pumping stations and inform operators through an alarm system of any faults such as power failure, pump failure or excess water levels. These alarms will require immediate attention.

All non-return valves will require routine maintenance to ensure that any debris is removed from them and that they can operate effectively.

Debris and Gravel Trap Maintenance

Maintenance of the debris and gravel traps will typically be carried out at times of low river flow and ideally during the summer months (May-September inclusive) except in the case of emergency. A permanent ramp will be constructed on the southern (right) riverbank approximately 50m upstream of the traps as part of the scheme. A tracked excavator will form a temporary ramp from adjacent riverbed gravels to extend the permanent ramp into the river. The excavator will travel on the riverbed close to and parallel to the riverbank until it reaches the location of the traps. The excavator will then form a causeway across the river to the northern bank, utilising gravels from the gravel trap and/or from the riverbed in the vicinity of the causeway. The top of the causeway will be approximately 300mm below water level. A mechanical grab and a dump truck will then be utilised to remove debris from the debris trap. On completion, the excavator with a dump truck will remove the causeway and any excess gravel in the gravel trap. The temporary ramp will also be removed.

Maintenance will typically be on an "as needs" basis as the quantities of gravel and floating debris will be determined by flows in the river. For the purposes of the EIAR, annual maintenance will be assessed as being carried out on both traps. The volume of material to be removed at any one time is not expected to exceed 350m3. This material will be removed to a suitable soil recovery facility.

Channel Maintenance

The altered channel profile and the provision of a gravel trap upstream of Arklow Bridge will reduce significantly the level of maintenance required for the river channel. It is expected however that there will be some level of sediment settling along the channel related to the flood scheme. Some dredging of the channel will be required from time to time. This will follow a similar methodology as the capital dredging as described for the construction stage above and will be dependent on where deposition occurs. This is estimated that maintenance dredging will be required every ten years but will be based on periodic surveys of the riverbed levels.

Riverbank Maintenance

Removal of branches and vegetation impacting on flood flows in the river will be carried out to improve the conveyance capacity of the river channel. This will be carried out annually, typically in Autumn prior to the winter flood season and over the stretch of river upstream of Arklow Bridge as far as the gravel and debris traps. Vegetation growing on Arklow Bridge will be removed as necessary as per the

recommendations detailed in the Conservation Engineering report included in Appendix 11.8 of the EIAR.

Landscape and Public Realm Maintenance

There will be periodic inspection of paved areas, footpaths, roads, street furniture, etc. Maintenance will be provided in response to such inspections e.g. cracks in footpaths, potholes in asphalt surfaces, failure of paviours and paving slabs, etc.

2.3. Baseline Environment

This section provides a description of the baseline environment of the proposed development area. The description of the baseline environment is based on a series of baseline field surveys[3] commissioned for the Arklow FRS and for the Arklow Wastewater Treatment Plant (WwTP) project, a review of relevant mapping and reports by the National Biodiversity Data Centre (NBDC) and NPWS, and existing reports of the area including the County Wicklow Wetland Survey II (Wilson *et al*., 2012[4]). The description of the baseline environment is also informed by site visits and surveys commissioned specifically for the Arklow FRS development (see **Table 2.2**) and surveys jointly commissioned for the Arklow FRS development and the Arklow WwTP project (see **Table 2.3**) and associated environmental documents prepared for the Arklow WwTP project[5].

2.3.1. Overview of Arklow Area/ Avoca Catchment

The Avoca River drains a primarily upland catchment of some 650km^2. It enters the Irish Sea at Arklow via a short river estuary that is largely contained by existing sea and harbour walls. The Avoca River is formed by the joining of the Avonmore and Avonbeg rivers, which rise in the Wicklow Mountains. The Avonmore River flows from Lough Dan, just west of Roundwood, and flows in a generally south-easterly direction for approximately 30km before meeting the Avonbeg River (which rises near Table Mountain at the top of Glenmalure Valley), just north of the village of Avoca, and becoming the Avoca River. Closer to Arklow, the Aughrim River and the Avoca River flow through steeply sloping wooded valleys and join at Woodenbridge. The valley sides, with both coniferous and deciduous

[3] Baseline desk studies and field surveys are described in detail in the Biodiversity Chapter of the Arklow FRS EIAR.

[4] Wilson, F., Crushell, P. Curtis, T. & Foss, P.J. 2012. The County Wicklow Wetland Survey II. Report prepared for Wicklow County Council and The Heritage Council.

[5] Arklow Wastewater Treatment Plant Project Environmental Impact Assessment Report (Arup, 2018a) and Natura Impact Statement (Arup, 2018b) are available at https://www.water.ie/planning-sites/arklow-wastewater/environmental-documents/

woodlands, are included within the Avoca River Valley proposed Natural Heritage Area (pNHA) (Site Code 001748). The Avoca River flows through lower ground from Shelton Abbey towards the Irish Sea and forms a west - east corridor through Arklow town. Upstream of Arklow Bridge is Arklow Town Marsh pNHA (Site Code 001931). This pNHA includes the Avoca River channel, and the wetland habitats that extend northwards from the bank of the river. The NPWS site synopsis report for the Arklow Town Marsh pNHA is included in **Appendix 1**.

Table 2.2: Biodiversity site visits/ surveys undertaken for the Arklow FRS development

Biodiversity Element	Site Visit/ Survey Details	Dates	Notes
Terrestrial habitat and plant species surveys	Terrestrial habitat and plant species walk-over surveys[6,]	July/ August 2020	A series of walkover terrestrial habitat and species surveys carried out by AQUAFACT specifically for the FRS.
	Terrestrial baseline studies	June 2017	Arklow Town Marsh surveyed by Natura Consultants to inform baseline studies for the proposed FRS
Bird species	Breeding Birds Survey at Arklow Town Marsh pNHA	26 April 2017, 03 May 2017, 26 May 2017	Breeding Birds Survey undertaken at Arklow Town Marsh pNHA by Natura Environmental Consultants.
Bat species	Bat Survey Arklow Bridge and Arklow Marsh	December 2020	Bat survey at Arklow Bridge carried out by Brian Keeley to inform Bat Derogation licence and bat mitigation.
Marine Invertebrates and Habitat	Benthic survey	August 2020	Survey in the lower part of the Avoca Estuary of carried out by AQUAFACT to document the conditions in terms of sediment quality and benthic infaunal invertebrate communities present.

[6] These surveys also recorded observations on evidence of terrestrial mammals. These observations are detailed in **Section 2.3.2.3.**

Table 2.3: Biodiversity joint site visits/ surveys undertaken for the Arklow WwTP and the Arklow FRS development

Biodiversity Element	Site Visit/ Survey Details	Details	Notes
Terrestrial habitat and plant species surveys	Flora and habitat and breeding bird surveys	27 June 2016, 10 August 2016, 26 April 2017, 22 August 2017, 12 April 2018, 16 May 2018	Some of the surveys were carried out within the planning boundary of the FRS. The relevant results of the surveys informed this report.
	Invasive plant species surveys	10 August 2016, 26 April 2017, 22 August 2017, 12 April 2018, 16 May 2018	
Bird species	Waterbird surveys	16 September 2016, 25 October 2016, 24 November 2016, 8 December 2016, 28 January 2017, 24 February 2017, 29 November 2017, 13 February 2018	
Bat surveys	Bat survey River Walk, Arklow Castle, The Alps, Arklow Bridge, and the northern bank of the Avoca River at Ferrybank including Brigg's Lane	17 October 2016, 19 October 2016, 22 to 29 August 2017	Survey carried out for the Arklow FRS development and Arklow WwTP project carried out by Brian Keeley. Some of the surveys (*e.g.* north bank and Arklow Bridge) were carried out within the planning boundary of the FRS. The other surveys (*e.g.* Arklow Castle and Alps) provide general information on bat activity in vicinity of Arklow town.
Estuarine and marine benthic survey	Survey for the Arklow FRS development and Arklow WwTP project carried out by BEC.	24 April 2017	Some of the stations were carried out within the planning boundary of the FRS just downstream of Arklow Bridge.
Freshwater macroinvertebrate survey	Survey for the Arklow FRS development and Arklow WwTP project carried out by BEC.	26 September 2017	Two of the stations (S1, S2) were carried out within the planning boundary of the FRS.

2.3.2. Fauna

2.3.2.1. Birds

As part of the Arklow WwTP project a series of 26 bird surveys were undertaken over 3 survey areas between September 2016 and February 2018 (Arup, 2018a,b). The survey areas were the Avoca River and Estuary, Arklow Pond, and nearby coastal waters. The surveys recorded a total of 22 waterbird species along the Avoca River and Estuary, at Arklow Pond and nearby coastal waters (see **Figure 2-18**). Gulls were the most numerous waterbirds, and were recorded in all three survey areas (see **Table 2.4**). Most of the gull use of the Avoca River and estuary was by birds roosting, bathing and preening; gulls use the gravel banks upstream of the Arklow Bridge to roost on, and bathe and preen in the fresh water of the river. Kingfisher listed in Annex I of the Birds Directive, was recorded on three separate occasions, flying along the northern bank of the Avoca River upstream of Arklow Bridge.

House Sparrow, Starling, Magpie and Wood Pigeon were recorded as present along River Walk and South Bank, and as breeding in the general area. Grey Wagtail and Pied Wagtail were consistently present along the Avoca River banks and feeding on exposed gravels.

Breeding birds recorded include Meadow Pipit and Grey Wagtail, Red listed as breeding birds of Conservation Concern in Ireland, and Barn Swallow, Robin, Stonechat, Starling, House Sparrow and Linnet, which are Amber listed.

Of the species identified during the surveys, 17 species are listed as SCIs of Irish SPAs some of which are species for which neighbouring SPAs are designated. The 17 species are highlighted in **bold** text in **Table 2.4**. The SPAs for which the SCIs in **Table 2.4** are designated are listed in **Section 2.4.3.4** below.

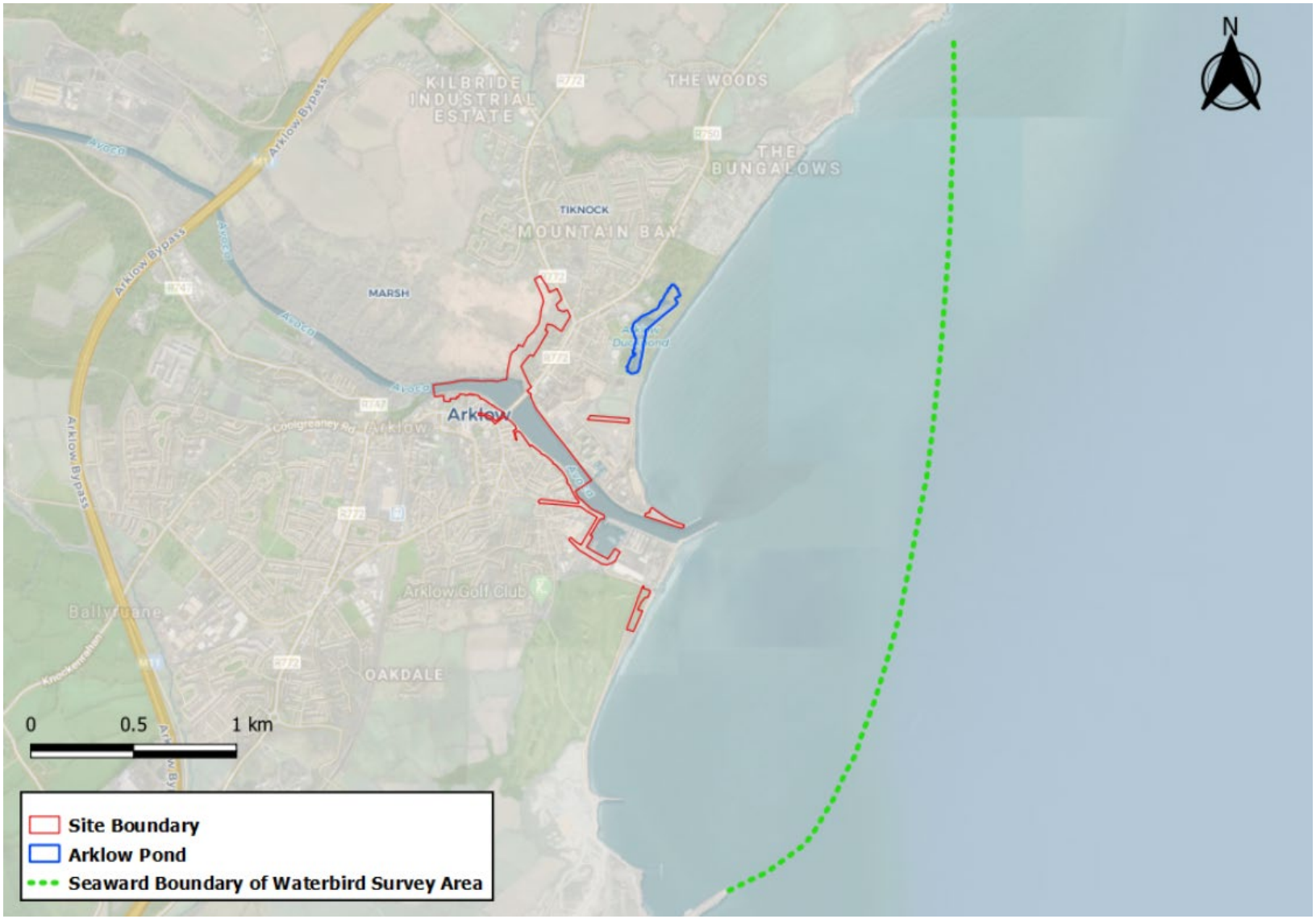

Figure 2-18: Bird survey areas

Table 2.4: Peak numbers of waterbirds recorded during baseline surveys at Arklow. SCI species highlighted in bold.

Species	Birds Directive Annex			Special Conservation Interest species of Irish SPAs. SPAs are listed in Section 2.4.3.4 below.	Birds of Conservation Concern in Ireland (BoCCI)[7]. Breeding = b, wintering =w)	Shoreline and coastal waters	Avoca River estuary	Arklow Pond
	I	II	III					
Black Headed Gull (*Chroicocephalus ridibundus*)	-	Yes	-	Yes – 19 SPAs	Red (b)	67	512	101
Common (or Mew) Gull (*Larus canus*)	-	Yes	-	Yes – 21 SPAs	Amber (b)	21	50	-
Common Sandpiper (*Actitis hypoleucos*)	-	-	-	-	Amber (b)	-	1	-
Coot (*Fulica atra*)	-	Yes	Yes	Yes – 12 SPAs	Amber (b/w)	-	-	1
Cormorant *Phalacrocorax carbo*)	Yes	-	-	Yes – 22 SPAs	Amber (b/w)	13	9	-
Great Black-backed (Gull *Larus marinus*)	-	Yes	-	-	Amber (b)	4	40	-
Greenland White-fronted (Goose *Anser albifrons flavirostris*)	-	-	-	Yes – 29 SPAs	Amber (w)	-	1	1
Grey Heron *Ardea cinerea*)	-	-	-	Yes – 4 SPAs	-	-	3	-
Greylag Goose (feral) (*Anser anser*)	-	Yes	-	Yes – 8 SPAs	-	-	43	29
Black Guillemot (*Cepphus grylle*)	-	-	-	-	-	4	-	-
Herring Gull (*Larus argentatus*)	-	Yes	-	Yes – 18 SPAs	Red (b)	150	390	2
Kingfisher (*Alcedo atthis*)	Yes	-	-	Yes – 2 SPAs	Amber (b)	-	1	-
Lesser Black-backed Gull (*Larus fuscus*)	-	Yes	-	Yes – 14 SPAs	Amber (b)	3	10	-
Little Grebe (*Tachybaptus ruficollis*)	-	-	-	Yes – 6 SPAs	Amber (b/w)	-	-	4
Mallard (*Anas platyrhynchos*)	-	Yes	Yes	Yes – 9 SPAs	-	-	49	51

[7] Colhoun K. and Cummins, S. 2013 Birds of Conservation Concern in Ireland 2014-19. Irish Birds 9:523-544

Species	Birds Directive Annex			Special Conservation Interest species of Irish SPAs. SPAs are listed in Section 2.4.3.4 below.	Birds of Conservation Concern in Ireland (BoCCI)[7]. Breeding = b, wintering =w)	Shoreline and coastal waters	Avoca River estuary	Arklow Pond
	I	II	III					
Mediterranean Gull (*Larus melanocephalus*)	Yes	-	-	-	Amber (b)	3	-	-
Moorhen (*Gallinula chloropus*)	-	Yes	-	-	-	-	4	5
Mute Swan (*Cyngus olor*)	-	-	-	-	Amber (b/w)	-	2	6
Oystercatcher (*Haematopus ostralegus*)	-	Yes	-	Yes – 16 SPAs	Amber (b/w)	3	-	-
Red-throated Diver (*Gavia stellata*)	Yes	-	-	Yes – 6 SPAs	Amber (b)	1	-	-
Ringed Plover (*Charadrius hiaticula*)	-	-	-	Yes – 15 SPAs	-	1	-	-
Teal (*Anas crecca*)	-	Yes	Yes	Yes – 21 SPAs	Amber (b/w)	-	-	1
Turnstone (*Arenaria interpres*)	-	-	-	Yes – 11 SPAs	-	12	12	-

The planning boundary for the proposed FRS overlaps part of the Arklow Marsh pNHA (see **Figure 2-19**).

The Arklow Marsh pNHA lies within four NBDC 2km^2 reporting grid squares (T27G, T27H, T27L, T27M). The NBDC reports[8] a total of 83 species of bird within T27G, T27H, T27L, T27M (see **Table 2.5**) of which 19 are listed as SCIs of Irish SPAs (see **Table 2.6**). The SPAs for which the SCIs listed in **Table 2.6** are designated are listed in **Section 2.4.3.4** below.

[8] http://maps.biodiversityireland.ie (accessed 05/02/2021)

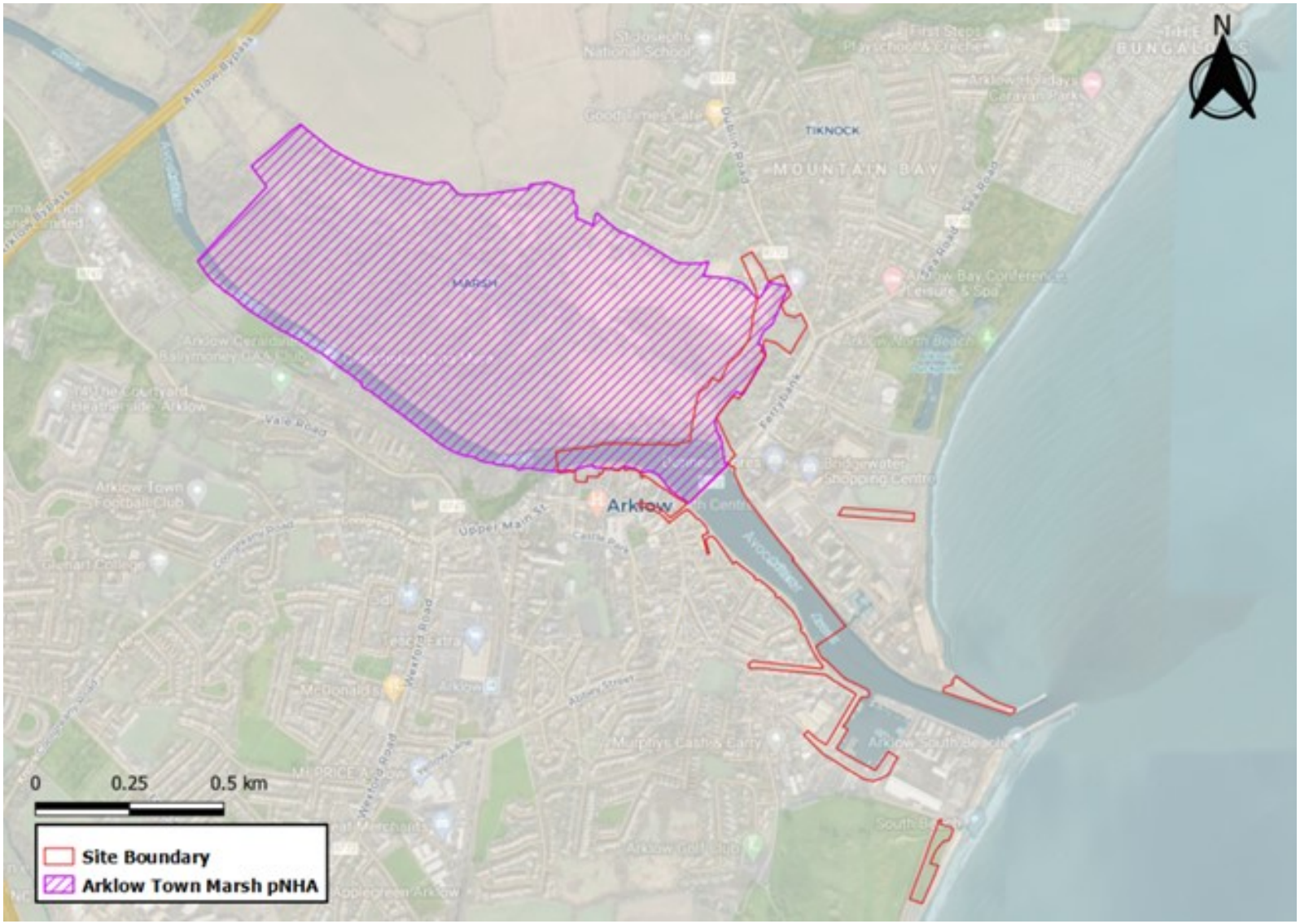

Figure 2-19: Planning boundary relative to Arklow Town pNHA.

Table 2.5: Bird species recorded with grid squares T27G, T27H, T27L, and T27M. SCI species highlighted in bold.

Species – (Special Conservation Interest species of Irish Special Protection Areas highlighted in bold)		
Barn Swallow (*Hirundo rustica*)	**Greylag Goose (*Anser anser*)**	Red Kite (*Milvus milvus*)
Black Kite (*Milvus migrans*)	Hedge Accentor (*Prunella modularis*)	Red-rumped Swallow (*Cecropis daurica*)
Black-billed Magpie (*Pica pica*)	**Herring Gull (*Larus argentatus*)**	Reed Bunting (*Emberiza schoeniclus*)
Blackbird (*Turdus merula*)	Hooded Crow (*Corvus cornix*)	Reed Warbler (*Acrocephalus scirpaceus*)
Blackcap (*Sylvia atricapilla*)	House Martin (*Delichon urbicum*)	Robin (*Erithacus rubecula*)
Black-headed Gull (*Larus ridibundus*)	House Sparrow (*Passer domesticus*)	Rook (*Corvus frugilegus*)
Blue Tit (*Cyanistes caeruleus*)	Iceland Gull (*Larus glaucoides*)	Rosy Starling (*Sturnus roseus*)
Bullfinch (*Pyrrhula pyrrhula*)	Jackdaw (*Corvus monedula*)	Sand Martin (*Riparia riparia*)
Buzzard (*Buteo buteo*)	**Kingfisher (*Alcedo atthis*)**	Sedge Warbler (*Acrocephalus schoenobaenus*)
Chaffinch (*Fringilla coelebs*)	Laughing Gull (*Larus atricilla*)	Siskin (*Carduelis spinus*)
Chiffchaff (*Phylloscopus collybita*)	**Lesser Black-backed Gull (*Larus fuscus*)**	Sky Lark (*Alauda arvensis*)
Coal Tit (*Periparus ater*)	Lesser Redpoll (*Carduelis cabaret*)	Snipe (*Gallinago gallinago*)
Collared Dove (*Streptopelia decaocto*)	Lesser Whitethroat (*Sylvia curruca*)	Song Thrush (*Turdus philomelos*)
Common (or Mew) Gull (*Larus canus*)	Linnet (*Carduelis cannabina*)	Sparrowhawk (*Accipiter nisus*)
Coot (*Fulica atra*)	Little Egret (*Egretta garzetta*)	Starling (*Sturnus vulgaris*)
Cormorant (*Phalacrocorax carbo*)	**Little Grebe (*Tachybaptus ruficollis*)**	Stonechat (*Saxicola torquata*)
Curlew (*Numenius arquata*)	Long-tailed Tit (*Aegithalos caudatus*)	Swift (*Apus apus*)
Goldcrest (*Regulus regulus*)	**Mallard (*Anas platyrhynchos*)**	Treecreeper (*Certhia familiaris*)
Golden Oriole (*Oriolus oriolus*)	Meadow Pipit (*Anthus pratensis*)	**Tufted Duck (*Aythya fuligula*)**
Golden Plover (*Pluvialis apricaria*)	Mistle Thrush (*Turdus viscivorus*)	Water Rail (*Rallus aquaticus*)
Goldeneye (*Bucephala clangula*)	Montagu's Harrier (*Circus pygargus*)	White Wagtail (*Motacilla alba*)
Goldfinch (*Carduelis carduelis*)	Moorhen (*Gallinula chloropus*)	Whitethroat (*Sylvia communis*)

Species – (Special Conservation Interest species of Irish Special Protection Areas highlighted in bold)		
Grasshopper Warbler (*Locustella naevia*)	Mute Swan (*Cygnus olor*)	**Wigeon (*Anas penelope*)**
Great Black-backed Gull (*Larus marinus*)	**Northern Lapwing (*Vanellus vanellus*)**	Willow Warbler (*Phylloscopus trochilus*)
Great Spotted Woodpecker (*Dendrocopos major*)	**Oystercatcher (*Haematopus ostralegus*)**	Winter Wren (*Troglodytes troglodytes*)
Great Tit (*Parus major*)	Pheasant (*Phasianus colchicus*)	Wood Pigeon (*Columba palumbus*)
Greenfinch (*Carduelis chloris*)	**Pochard (*Aythya ferina*)**	Woodcock (*Scolopax rusticola*)
Grey Heron (*Ardea cinerea*)	Raven (*Corvus corax*)	

Table 2.6: SCI bird species recorded with grid squares T27G, T27H, T27L, and T27M

Species	Birds Directive Annex			Special Conservation Interest species of Irish Special Protection Areas. SPAs are listed in Section 2.4.3.4 below.	Birds of Conservation Concern in Ireland (BoCCI). Breeding = b, wintering =w)
	I	II	III		
Black Headed Gull (*Chroicocephalus ridibundus*)	-	Yes	-	Yes – 19 SPAs	Red (b)
Common (or Mew) Gull (*Larus canus*)	-	Yes	-	Yes – 21 SPAs	Amber (b)
Coot (*Fulica atra*)	-	Yes	Yes	Yes – 12 SPAs	Amber (b/w)
Cormorant (*Phalacrocorax carbo*)	Yes	Yes	-	Yes – 22 SPAs	Amber (b/w)
Curlew (*Numenius arquata*)	-	Yes	-	Yes – 19 SPAs	-
Golden Plover (*Pluvialis apricaria*)	Yes	Yes	Yes	Yes – 36 SPAs	-
Goldeneye (*Bucephala clangula*)	-	Yes	-	Yes – 6 SPAs	-
Grey Heron (*Ardea cinerea*)	-	-	-	Yes – 4 SPAs	-
Greylag Goose (*Anser anser*)	-	Yes	-	Yes – 8 SPAs	-
Herring Gull (*Larus argentatus*)	-	Yes	-	Yes – 18 SPAs	Red 9b)
Kingfisher (*Alcedo atthis*)	Yes	-	-	Yes – 2 SPAs	Amber (b)
Lesser Black-backed Gull (*Larus fuscus*)	-	Yes	-	Yes – 14 SPAs	Amber (b)
Little Grebe (*Tachybaptus ruficollis*)	-	-	-	Yes – 6 SPAs	Amber (b/w)
Mallard (*Anas platyrhynchos*)	-	Yes	Yes	Yes – 9 SPAs	-
Northern Lapwing (*Vanellus vanellus*)	-	Yes	-	Yes – 23 SPAs	Amber (b/w)
Oystercatcher (*Haematopus ostralegus*)	-	Yes	-	Yes – 16 SPAs	Amber (b/w)
Pochard (*Aythya ferina*)	-	Yes	Yes	Yes – 6 SPAs	Red (w)
Tufted Duck (*Aythya fuligula*)	-	Yes	Yes	Yes – 11 SPAs	Red (w)
Wigeon (*Anas penelope*)	-	Yes	Yes	Yes – 25 SPAs	Red (w)

2.3.2.2. Migratory Fish

Despite the negative impacts on the Avoca River from the acid mine drainage and the release of untreated wastewater (Arup, 2018a,b), the river and estuary continue to support a diverse fish population. Surveys of the Avoca River Estuary carried out under the WFD classed this waterbody as 'Moderate' status for the fish populations in both the 2008 and 2010 sampling periods (Kelly et al, 2009[9], Kelly et al, 2011[10]). The Avoca River Estuary was classified as 'Good' status for fish populations in 2015 (Ryan et al, 2015). The overall WFD status of the Avoca Estuary for the period 2010 to 2015 is 'Moderate' (EPA data, Site Code IE_EA_150_0100).

The river and estuary provides a migration corridor for Habitats Directive Annex II listed diadromous fish species Atlantic Salmon *Salmo salar*, River Lamprey *Lampetra fluviatilis* and Sea Lamprey *Petromyzon marinus*. The deep and slow flowing nature of the Avoca River immediately upstream, and the estuarine area within the Arklow FRS planning boundary do not provide suitable spawning habitat for salmon or lamprey species, which require shallower, faster flowing water over suitable spawning gravel (O'Reilly, 2009[11]). In addition, it should be noted that as result of the impact of both historical mining and the disposal of untreated sewage effluent on water quality and sediment chemistry, habitat quality of the lower reaches of the river makes the area unsuitable for fish egg laying/ development.

The closest SAC to the proposed development area designated for these species is the Slaney River Valley SAC (Site Code 000781). There are no rivers connecting the SAC to the proposed development area. By sea, the shortest distance of the SAC from the proposed development area is over 50km.

[9] Kelly, F., Harrison, A., Connor, L., Wightman, G., Matson, R., Morrissey, E., O'Callaghan, R., Feeney, R., Hanna, G., Lordan, M. and Rocks, K. (2009). Sampling Fish for the Water Framework Directive – Transitional Waters 2008. Avoca Estuary. The Central and Regional Fisheries Boards.

[10] Kelly, F., Harrison, A., Connor, L., Matson, R., Morrissey, E., O'Callaghan, R., Feeney, R., Wögerbauer, C., Hanna, G., Gallagher, K. and Rocks, K. (2011). Sampling Fish for the Water Framework Directive – Transitional Waters 2010. Avoca Estuary. Inland Fisheries Ireland.

[11] O'Reilly, P. (2009) Rivers of Ireland, a Flyfisher's Guide (7th Edition). Merlin Unwin Books, Shropshire, UK

2.3.2.3. Mammals

Bat Species

Bat surveys[12] undertaken in 2016 and 2017 as part of the Arklow WwTP project recorded four Habitats Directive Annex IV species bat species along the Arklow Bridge, Avoca River corridor, Arklow Town Marsh pNHA, and at Arklow Pond. The species recorded include Common Pipistrelle *(Pipistrellus pipistrellus*), Soprano Pipistrelle (*Pipistrellus pygmaeus*), Leisler's Bat (*Nyctalus leisleri*) and Daubenton's Bat (*Myotis daubentonii*).

In 2020 a bat survey undertaken to inform the application to NPWS for a bat derogation licence required for the proposed works at Arklow Bridge identified Daubenton's bat at the Bridge.

The Lesser Horseshoe bat (*Rhinolophus hipposideros*) [1303] which is a Habitats Directive Annex II and IV species is confined to six west coast counties: Mayo, Galway, Clare, Limerick, Cork and Kerry (NPWS, 2019). The closest SAC to the proposed development designated for Lesser Horseshoe bat is Danes Hole, Poulnalecka SAC in Co . Clare, a distance of over 170km.

Otter

A single sighting of otter in the proposed development was reported through the NBDC. During walkover surveys undertaken as part of the Arklow WwTP project evidence of otter spraint was recorded at two locations along the south bank of the Avoca River between the M11 Bridge and the start of the built-up banks in Arklow Town upstream of the FRS planning boundary. It should be noted that it is likely that the vegetation at the banks of the Arklow Town pNHA provide suitable habitat for the species, habitat surveys undertaken at the pNHA did not report evidence of otter runs or slides in the area. Two individuals (1 adult and 1 juvenile) were observed feeding along the south bank in the early morning during the course of fieldwork carried out by AQUAFACT in summer of 2020.

Seal

The NBDC database includes a single sighting of Common Seal (*Phoca vitulina*) in the outer estuary in 2016. Site investigation works have been carried out in the Avoca River estuary and in Arklow Bay to inform the Arklow WwTP project. As part of the work the contractor was required to appoint a qualified Marine Mammal Observer (MMO) to monitor for marine mammals and to log all relevant events during the intrusive ground investigations. A total of 30 MMO watches, with a total duration of

[12] Bat survey report available at https://www.water.ie/planning-sites/arklow-wastewater/docs/environmental-documents/volume-4/Appendix%2011.4%20-%20Bat%20Survey%20Report%20.pdf

268 hours of observations, was carried out during the 30 minutes prior to, and during site investigation works. During the watches no marine mammals were recorded.

In addition, as part of the Arklow WwTP project a series of bird surveys of coastal waters were undertaken between Nov 2016 and Feb 2018. During these surveys, a single Common Seal was observed on one occasion in coastal waters.

2.3.3. Habitats and Flora

As part of the Arklow FRS development and Arklow WwTP project a series of walkover terrestrial habitat and species surveys were conducted along River Walk along the south bank of the river upstream of the bridge, at Arklow Town Marsh pNHA on the north bank upstream of Arklow Bridge), and along North Quay and South Bank (downstream of Arklow Bridge) and at Arklow Bridge. Walkover surveys were also carried out at the locations proposed for construction compounds (SC1-SC6) for the Arklow FRS development. Where walkover surveys undertaken for the Arklow FRS development covered areas previously surveyed for the Arklow WwTP the survey findings were updated and/ or verified (see **Figure 2-20**, **Figure 2-21** and **Table 2.7**).

Terrestrial biodiversity is assessed as being of high local importance upstream of Arklow Bridge. High local importance upstream of the Arklow Bridge is largely due to the presence of natural river banks and mature trees along the north and south banks of the Avoca and the marsh area on the north bank which forms part of the Arklow Town Marsh pNHA. The habitats recorded at SC1 and SC3 are locally important while those at SC4 are of low local importance. Habitats recorded downstream of Arklow Bridge along both the south and north quays and those at SC2, SC5 and SC6 are of low ecological importance.

The total area of the Arklow Town Marsh pNHA measures approximately 83.84ha (NPWS 2009[13] see **Appendix 1**). The pNHA comprises part of the Avoca River and a large wetland and terrestrial habitat area on the north bank. Approximately 3.57ha of the river area of the pNHA lies within the proposed FRS boundary area (see **Figure 2-20**, **Figure 2-21**); this area includes a number of vegetated islands and a gravel bank area located immediately upstream of the Arklow Bridge. Approximately 3.05ha of wetland and terrestrial habitat within the pNHA lies within the proposed FRS boundary area (see **Figure 2-20**, **Figure 2-21**).

[13] NPWS 2009. Site Synopsis Site Name: Arklow Town Marsh Site Code: 001931. https://www.npws.ie/protected-sites/nha

The marsh area of the pNHA is dominated by Common Reed (*Phragmites australis*), with Creeping Bent (*Agrostis stolonifera*) and Common Valerian (*Valeriana officinalis*) common in places (see NPWS 2009). On the southern side, numerous scattered bushes of willow (*Salix spp.*) are growing among the Common Reed, forming a scrub in places. Drier areas are characterised by large tussocks of Tufted Hair-grass (*Deschampsia cespitosa*). Other plants present include Soft Rush (*Juncus effusus*), Yellow Iris (*Iris pseudacorus*), Skullcap (*Scutellaria galericulata*), Lesser Pond-sedge (*Carex acutiformis*) and several other sedges (*Carex spp.*). Wet grassy areas with extensive stands of Water Horsetail (*Equisetum fluviatile*) occur on the north-east margin, with Creeping Bent, Common Spike-rush (*Eleocharis palustris*), Meadowsweet (*Filipendula ulmaria*) and rushes (*Juncus articulatus* and *J. conglomeratus*) present.

The lower reaches of the Avoca River have been highly modified by human activity through the construction of estuarine retaining walls and harbour breakwaters (Arup, 2018a,b). The benthic habitats outside the Avoca Estuary are characterised by muddy sand and mixed sediments. The area is dominated by a single biotope *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment. This biotope is common and widespread along the east coast of Ireland. River water quality has been impacted by acid mine drainage from the Avoca Mines upstream and the input of untreated wastewater (Arup, 2018 a,b). This limits the diversity of invertebrate species in the estuary and also in the adjoining coastal water. The marine benthic community outside the Avoca Estuary has a depressed species richness compared to what might be expected from the habitat present and is of low ecological value.

The NBDC reports[14] the invasive plant species Japanese Knotweed (*Fallopia japonica*) and Rhododendron (*Rhododendron ponticum*) within T27G, T27H, T27L, T27M. The location of these records relative the Arklow FRS site boundary and Arklow Town pNHA boundary are shown in **Figure 2-22**.

[14] http://maps.biodiversityireland.ie (accessed 05/02/2021)

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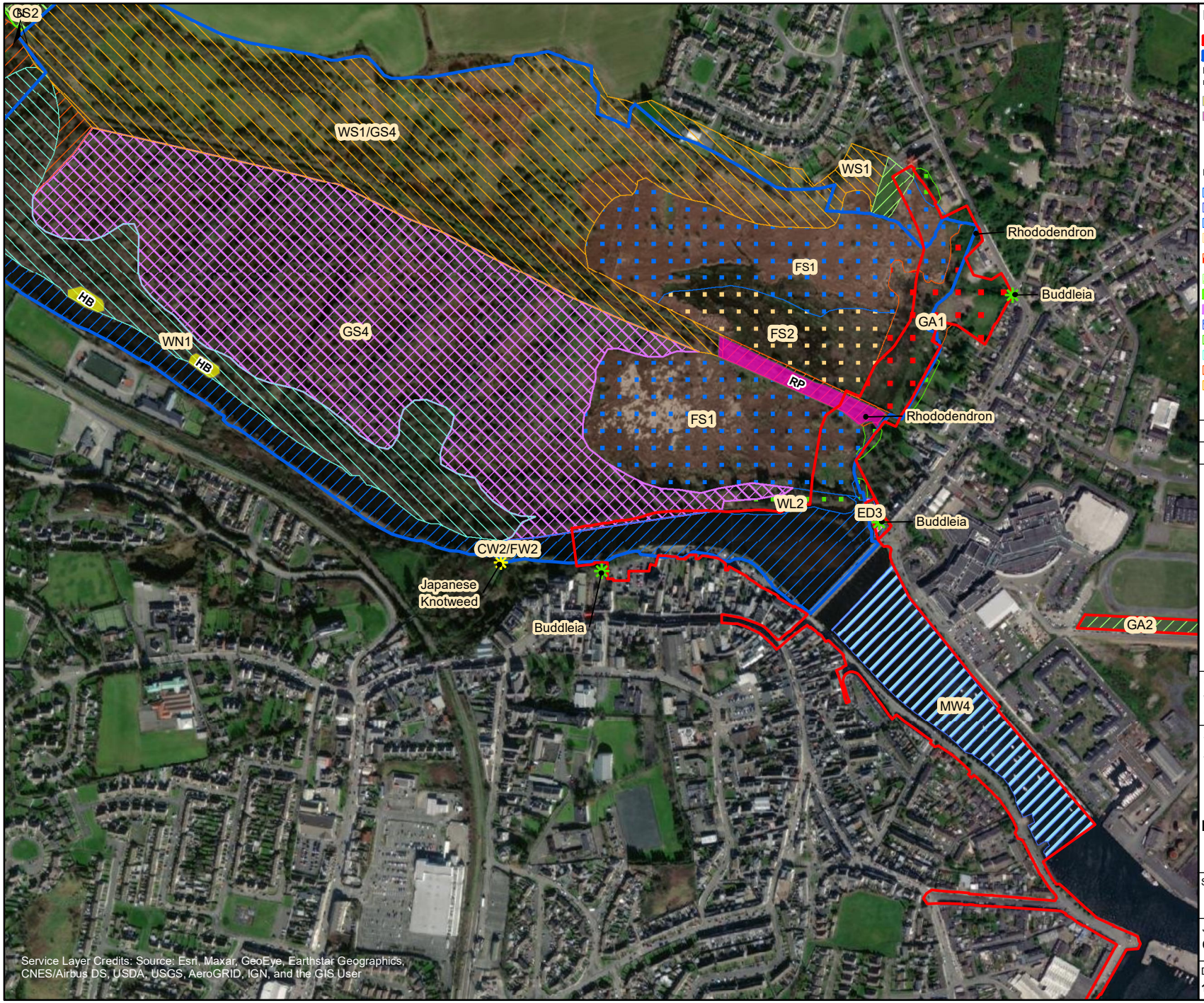

Legend

- Arklow FRS Boundary
- pNHA Boundary

Invasive Species (Approximate location, do not rescale)

- HB Himalayan Balsam
- RP Rhododendron ponticum
- Buddleia
- Japanese Knotweed

Habitat

- CW2 Tidal rivers/FW2 Depositing lowland rivers
- ED3 Recolonising bare ground
- FS1 Reed and tall sedge swamps
- FS2 Tall-herb swamps
- GA1 Improved agricultural grassland / GS4 Wet land
- GA2 Amenity grassland
- GS2 Dry meadows and grassy verges
- GS4 Wet grassland
- MW4
- WL2 Treelines
- WN1 Oak-birch-holly woodland
- WS1 Scrub
- WS1 Scrub / GS4 Wet Grassland

Issue	Date	By	Chkd	Appd
D2	2021-04-16	LM	LG	FP

Kilometers

0 0.075 0.15 0.3

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Client

Wicklow County Council
Office of Public Works

Job Title

Arklow Flood Relief Scheme

Habitat and Invasive Species Survey

Scale at A4

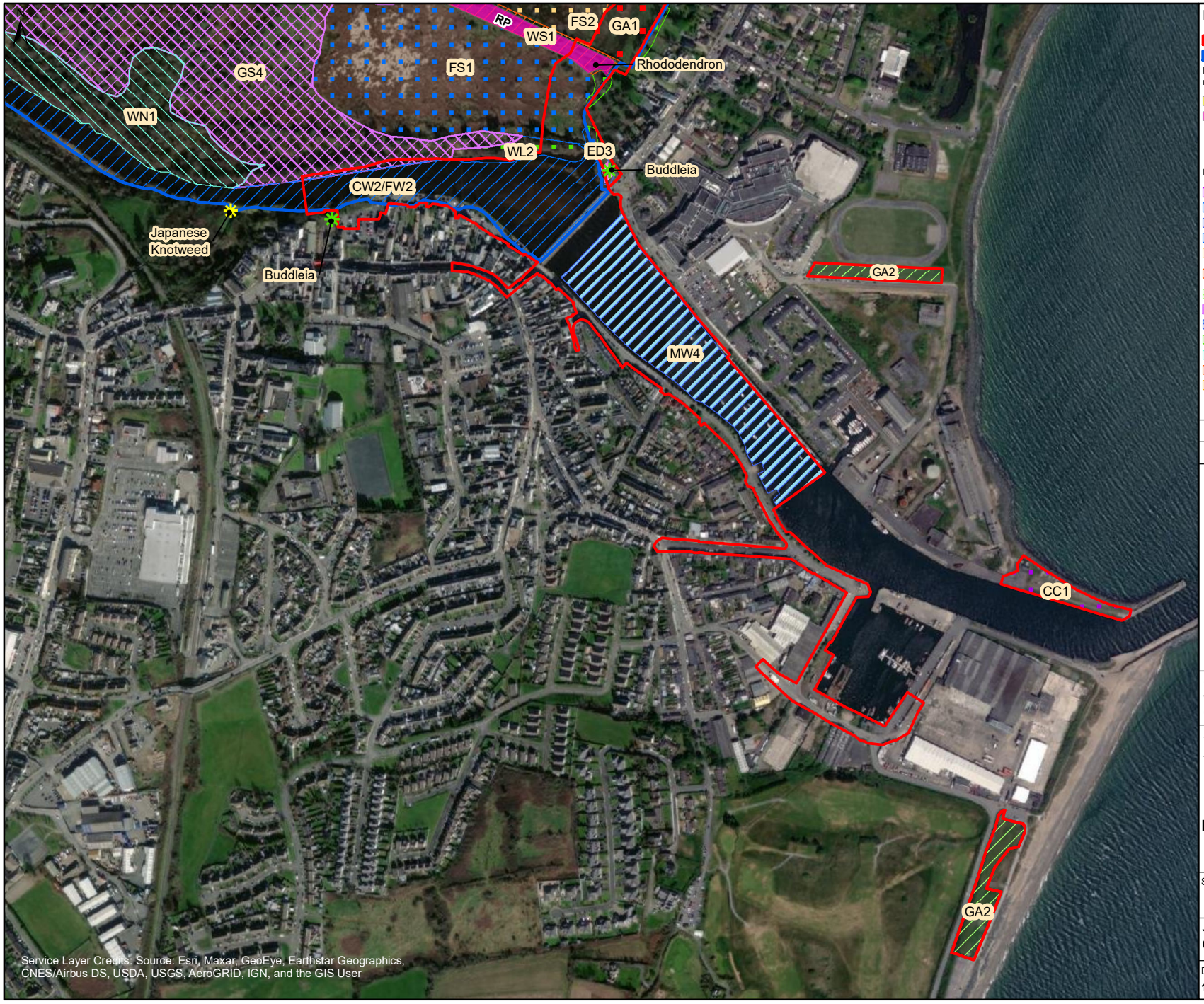
1:8,000

Job No	Drawing Status
605246-40	**Issue**

Drawing No	Issue
10.6	**I1**

21/03/2018 11:12:09

A4



Legend

- Arklow FRS Boundary
- pNHA Boundary

Invasive Species (Approximate location, do not rescale)

- HB Himalayan Balsam
- RP Rhododendron ponticum
- Buddleia
- Japanese Knotweed

Habitat

- CC1 Sea walls, piers and jetties
- CW2 Tidal rivers/FW2 Depositing lowland rivers
- ED3 Recolonising bare ground
- FS1 Reed and tall sedge swamps
- FS2 Tall-herb swamps
- GA1 Improved agricultural grassland / GS4 Wet land
- GA2 Amenity grassland
- GS4 Wet grassland
- MW4
- WL2 Treelines
- WN1 Oak-birch-holly woodland
- WS1 Scrub
- WS1 Scrub / GS4 Wet Grassland

Issue	Date	By	Chkd	Appd
D2	2021-04-16	LM	LG	FP

Kilometers

0 0.075 0.15 0.3

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Client

Wicklow County Council
Office of Public Works

Job Title

Arklow Flood Relief Scheme

Habitat and Invasive Species Survey

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1:8,000

Job No	Drawing Status
605246-40	**Issue**

Drawing No	Issue
10.7	**I1**

21/03/2018 11:12:09

Table 2.7: Habitats

Habitat (Fossitt classification)	River Walk & South Bank	North Quay (downstream of bridge)	Arklow Bridge	Arklow Town Marsh pNHA	SC1	SC2	SC3	SC4	SC5	SC6[15]
BC4 Flower beds and borders	✓	✓								
BL1 Stone walls and other stonework	✓	✓								
BL3 Buildings and artificial surfaces								✓		✓
CC1 Sea walls, piers and jetties									✓	
CW2 Tidal rivers/ FW2 Depositing lowland rivers[16]	✓	✓	✓	✓						
ED2 Spoil and bare ground	✓	✓								
ED3 Recolonising bare ground	✓	✓		✓						
FS1 Reed and tall sedge swamp				✓						
FS2 Tall-herb swamp				✓						
FW4 Drainage ditches / FW3 Canals				✓						
GA1 Improved agricultural grassland / GS4 Wet land				✓	✓					

[15] Moore's horsetail *Equisetum x moorei* recorded at SC6 in July 2007 (Curtis, T. and Wilson, F. 2007. Wicklow Rare/Threatened and Scarce Plant Survey 2007. National Parks and Wildlife Service).

[16] Includes vegetated islands and gravel bank areas located immediately upstream of the Arklow Bridge.

Habitat (Fossitt classification)	River Walk & South Bank	North Quay (downstream of bridge)	Arklow Bridge	Arklow Town Marsh pNHA	SC1	SC2	SC3	SC4	SC5	SC6[15]
GA2 Amenity grassland	✓	✓				✓				✓
GM1 Marsh				✓						
GS4 Wet grassland				✓						
MW4 Estuaries	✓	✓	✓							
WL2 Treelines	✓	✓		✓						
WN1 Oak-birch-holly woodland				✓						
WS1 Scrub		✓		✓			✓			
WS1 Scrub / GS4 Wet Grassland				✓						
WS3 Ornamental non-native shrub	✓	✓		✓						
RP Rhododendron (*Rhododendron ponticum*)				✓	✓					
HB Himalayan balsam (*Impatiens glandulifera*[17])				✓						
BD Butterfly-bush (*Buddleia davidii*)	✓				✓		✓			
JK Japanese Knotweed (*Fallopia japonica*)	✓									

[17] The invasive species *Himalayan balsam* is recorded at three locations adjacent to the Avoca River within the Arklow Town Marsh pNHA (see **Figure 2-20**). These areas are located approximately 500m, 800m and 900m north west of the Arklow FRS planning boundary.

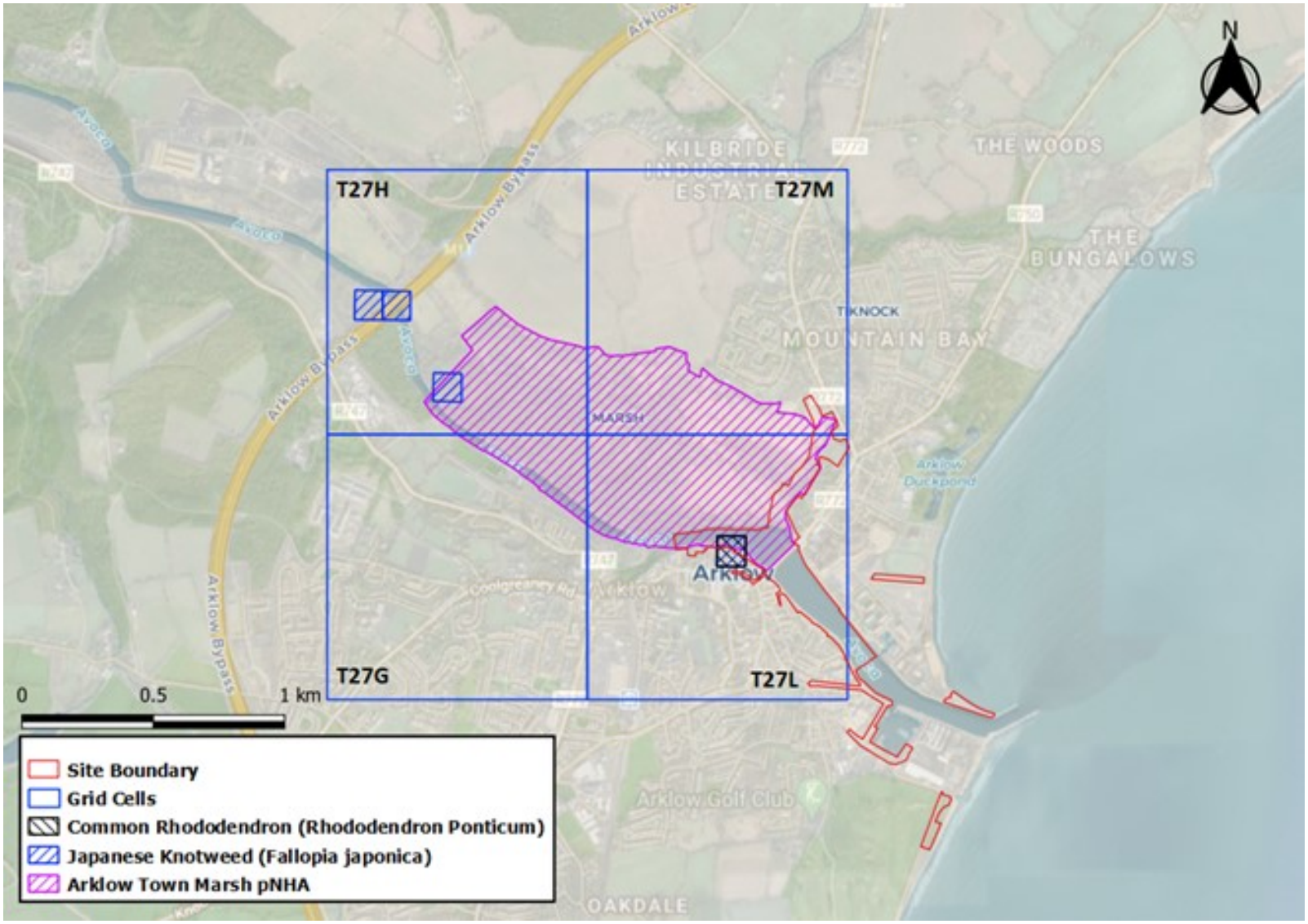


Figure 2-22: NBDC record of invasive species within grid squares T27G, T27H, T27L, and T27M relative to Arklow FRS site boundary and Arklow Town pNHA

2.4. Screening Exercise

A key factor in the consideration as to whether or not a QI of a SAC or a SCI of a SPA is likely to be affected by a proposed project is the existence of connectivity (or interaction/ or impact pathway) between the designated feature and the impact mechanisms associated with the project.

National guidance (DEHLG 2009) states that screening for AA should be carried out for any European site within the likely 'Zone of Impact' of a plan or project. For projects, the guidance outlines that the Zone of Impact must be evaluated on a case-by-case basis.

Here the evaluation of the Zone of Impact considered the potential for effects to conservation features within (in-situ) and outside (ex-situ) the proposed development area and European sites, with reference to the nature, size and location of the project, its location in relation to individual European sites and the Conservation Objectives defined for their conservation features, and with reference to the sensitivities of the receptors, and the potential for in-combination effects.

As a starting point, the assessment of potential effect presented here considered potential connectivity to European sites within a 15km[18] radius of the proposed development (as measured using the shortest linear distance[19]). The assessment also considered potential effects to highly mobile protected conservation features species of more distant European sites that may occur in the development area and thereby be affected.

2.4.1. Methodology - Source-Pathway-Receptor and Impact Assessment

As outlined in **Section 1.3** above, this *Screening Statement for AA and NIS* focuses on the potential likely significant effects to conservation features of European sites.

The screening exercise considers potential *in situ* and *ex situ* effects to conservation features (*i.e.* potential effects to conservation features within or away from European sites respectively). In order to establish the Zone of Impact of the proposed development, the assessment of connectivity between impact mechanisms (or source) and a conservation feature (*i.e.* QIs of SACs and SCIs of SPAs) considers the location of the proposed development relative to habitats and non-mobile species, species foraging distances and migration routes, and the proximity of the proposed development to foraging and breeding areas, and potential changes in species behaviour, potential hydrological connectivity

[18] A distance of 15 km is used as a potential zone of impact, and this distance is derived from UK guidance (Scott Wilson *et al*., 2006 referenced in DEHLG, 2009).

[19] Distances are the shortest straight-line distance (i.e. as the 'crow flies').

between the proposed development and conservation features, effects on prey species resulting in alteration in interactions and associated impacts.

To inform the assessment of risk to European sites, nationally available data on protected habitats and species was mapped using a Geographic Information System (GIS) and interrogated to identify for source-pathway-receptor connectivity. The assessment was also informed by the findings of baseline field surveys[20] commissioned by Wicklow County Council and Irish Water for the Arklow FRS and the Arklow Wastewater Treatment Plant (WwTP) projects, a review of relevant mapping and reports by the National Biodiversity Data Centre (NBDC) and NPWS, walkover surveys undertaken in 2020 at the construction compounds and existing reports of the area including the County Wicklow Wetland Survey II (Wilson *et al*., 2012[21]). The description of the baseline environment is also informed by the EIAR and NIS documents prepared for the Arklow WwTP project[22].

The source (potential impact mechanisms), pathways (hydrological, physical or ecological connectivity) and receptors (QIs and SCIs of the European sites) were identified using GIS software, and through the examination of aerial photography, mapping and review of biological receptors recorded at the proposed development site during walkover surveys and in environmental assessment reports prepared for the area. The assessment of project impact sources (or mechanisms) considers all relevant aspects of the proposed development that have potential direct or indirect *in situ* and *ex situ* effects on conservation features.

2.4.2. Identification of Potential Impact Mechanisms based on the Nature, Size and Location of the Project

A detailed description of the proposed development is provided in **Section 2.2**. In summary, the proposed development will involve the construction of flood defences and an embankment, as well as conveyance improvements in the Avoca River; including deepening of the river channel, the introduction of new debris and gravel traps and strengthening works to the existing quay walls and Arklow Bridge. The Avoca River is tidal in the Arklow area and some of the proposed development will be located in the foreshore. Future maintenance of the Arklow Flood Relief Scheme will also be carried

[20] Baseline desk studies and field surveys are described in detail in the Biodiversity Chapter of the Arklow FRS EIAR (see **Appendix 2**)

[21] Wilson, F., Crushell, P. Curtis, T. & Foss, P.J. 2012. The County Wicklow Wetland Survey II. Report prepared for Wicklow County Council and The Heritage Council.

[22] Arklow Wastewater Treatment Plant Project Environmental Impact Assessment Report (Arup, 2018a) and Natura Impact Statement (Arup, 2018b) are available at https://www.water.ie/planning-sites/arklow-wastewater/environmental-documents/

out. Wicklow County Council considers Arklow FRS to be a key strategic asset in the protection of Arklow Town from flooding and it will have a minimum of a 50 year design life. As such it is anticipated that the proposed development will be maintained by Wicklow County Council in the long term.

The impact mechanisms of concern with regard to effects to conservation features of SACs and SPAs are associated with the proposed construction and operational phases.

Impact Mechanism 1 Discharges

As with any construction activity there is a risk potential that activities proposed for construction and operational phases of the proposed development (including construction, excavation work, capital and maintenance dredging operations, installation of permanent river side ramps, installation/ removal of temporary river access points, haul roads and causeways, maintenance of debris and gravel traps) may result in the release of sediments to the marsh habitats of the pNHA and to the nearby watercourses including the river.

There is risk that activities associated with the construction phase may result in the accidental release of chemicals or other waste material pollution. Potential pollutants associated with construction plant equipment include fuels, oils, greases hydraulic fluids (hydrocarbons).

Dredge material excavated from the river and lower estuary area will have water with a high chlorine content (HCC). The excavated material may also be contaminated. Dredge material will be temporarily stored at site compound SC1 pending archaeological investigation and the use of the dredge material for the construction of the flood embankment at the marsh area. There is potential that runoff from the stockpiles of excavated dredge material may result in the introduction of sediment and, hazardous and non-hazardous contaminants and HCC water to the nearby marsh habitats and river, potentially impacting habitat and water quality. It is likely that HCC water will percolate into the ground at SC1 or under the constructed flood embankment.

During bridge masonry repair works, plant roots attached to the bridge will be treated using herbicide; accidental release of herbicides to the river may impact water quality. Water quality may also be affected by the accidental release of concrete and grouting materials. There is also potential that water quality may be affected by the accidental release of concrete and grouting materials.

Impact Mechanism 2 Loss of in-river habitat

An overview of the location of elements of the proposed development that will result in loss of habitats is shown in **Figure 2-23**.

Elements that will result in loss of in-river habitat include the construction of river access points, temporary causeways, the installation of the debris and gravel traps and riprap within the river

channel, in-stream capital dredging including the removal of the in-stream vegetated islands and gravel bank located upstream of the Arklow bridge, maintenance channel dredging, installation and removal of temporary in-stream access ramps to allow access to and maintenance of debris and gravel traps (**Figure 2-23**). The construction of flood walls along River Walk, South Quay and around the dock on the south (right) bank, will result in in-river habitat loss at two locations, one upstream and one downstream of the Bridge.

Impact Mechanism 3 Noise disturbance

Construction activity including the construction and demolition works, pilling operations, capital and occasional channel dredging and, the installation and removal of temporary in-stream access ramps for debris and gravel trap maintenance will result in noise emissions with potential disturbance to fish species.

Impact Mechanism 4 Loss of habitat at Arklow Town Marsh pNHA

Elements of the proposed development that will result in the loss of habitat area and vegetation of the Arklow Town Marsh pNHA are the construction of the flood wall along the north bank immediately upstream of the Arklow Bridge and the installation of the embankment at the marsh area (**Figure 2-23**).

Impact Mechanism 5 Barrier to faunal movement

Potential that during the operational phase debris trap and gravel traps may act as a barrier to faunal movement in the river.

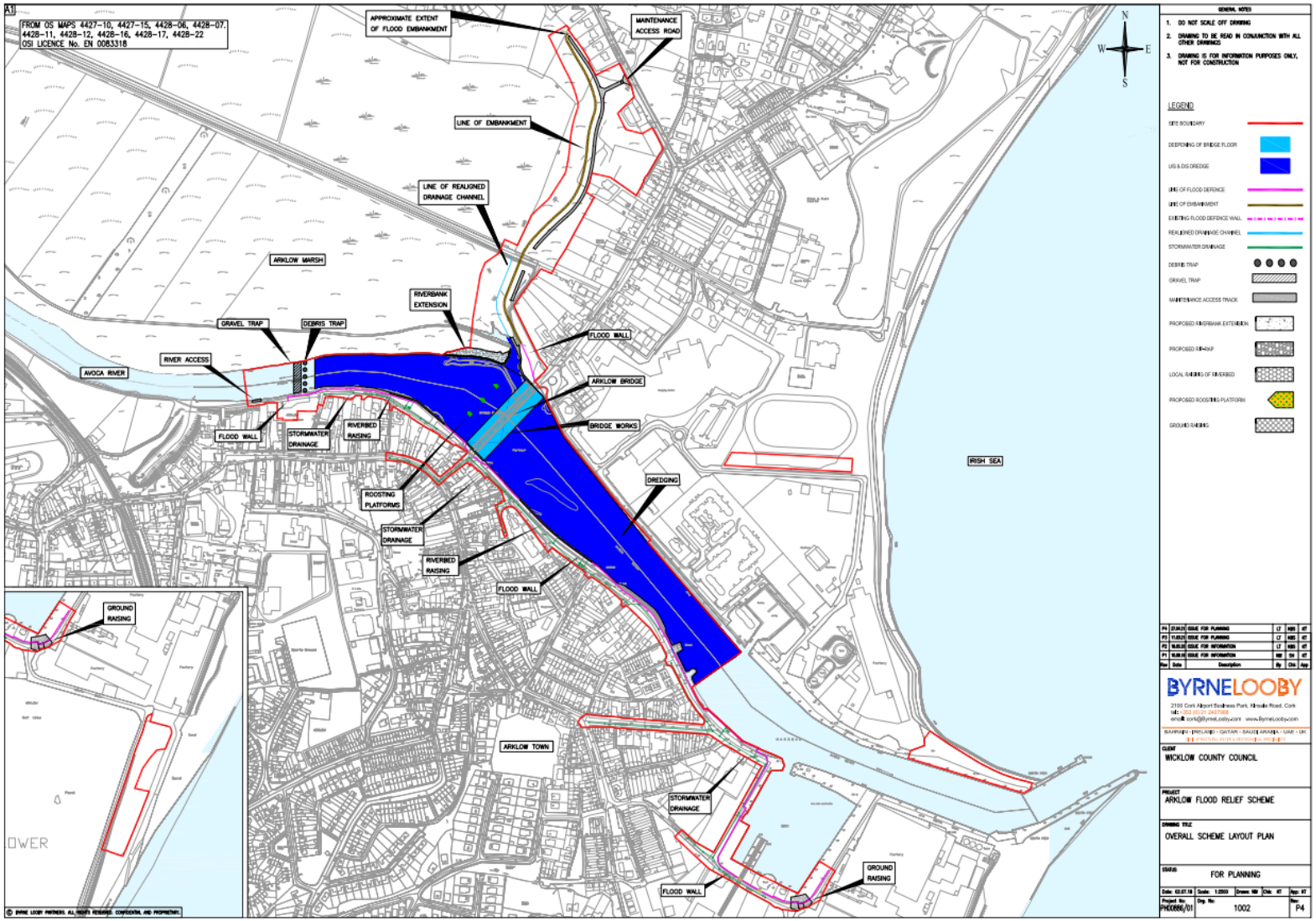


Figure 2-23: Flood defence wall & embankment key plan (Refer to Drawing 1002)

2.4.3. Potential Connectivity and Effects

This section presents a screening exercise of the potential effects (direct or indirect) of impact mechanisms associated with the proposed development (identified in **Section 2.4.2** above) to conservation features of European sites.

The screening exercise considers the potential for the proposed development to have significant *in situ* and *ex situ* effects on European sites (*i.e.* potential effects to conservation features within or away from European sites respectively).

Where it cannot be excluded on the basis of objective information that the proposed development, individually or in combination with other plans or projects, will have a significant effect on a European site then it is necessary to carry out a stage 2 appropriate assessment (*i.e.* **Section 3** NIS).

Specifically **Section 2.4.3.1** presents a screening exercise of the interaction and potential impact to Qualifying Features of European site located within 15km of the project while **Section 2.4.3.3** considers interaction and potential impact to wide ranging Qualifying Features of SACs and SPAs located more that within 15km from the project that may be found in the vicinity of the project area.

2.4.3.1. Conservation Features of European sites within a 15km radius

2.4.3.2. QIs of SACs

The European sites within 15km of the proposed development site are shown in **Figure 2-24**. The sites are:

- Buckroney – Brittas Dunes and Fen SAC (Site Code 000729) (4.9km north of the proposed development)
- Kilpatrick Sandhills SAC (Site Code 001742) (6.8km south)
- Slaney River Valley SAC (Site Code 000781) (13.3km west)
- Magharabeg Dunes SAC (Site Code 001766) (14.8km north)

Full Site Synopsis reports for the SAC sites are included in **Appendix 3.**

The QIs of the SACs and the conservation objectives set for the QIs are listed in **Table 2.8** alongside screening assessments of potential significant effect of impact mechanism 1, 2, 3, 4 and 5 to the conservation features of the European sites.

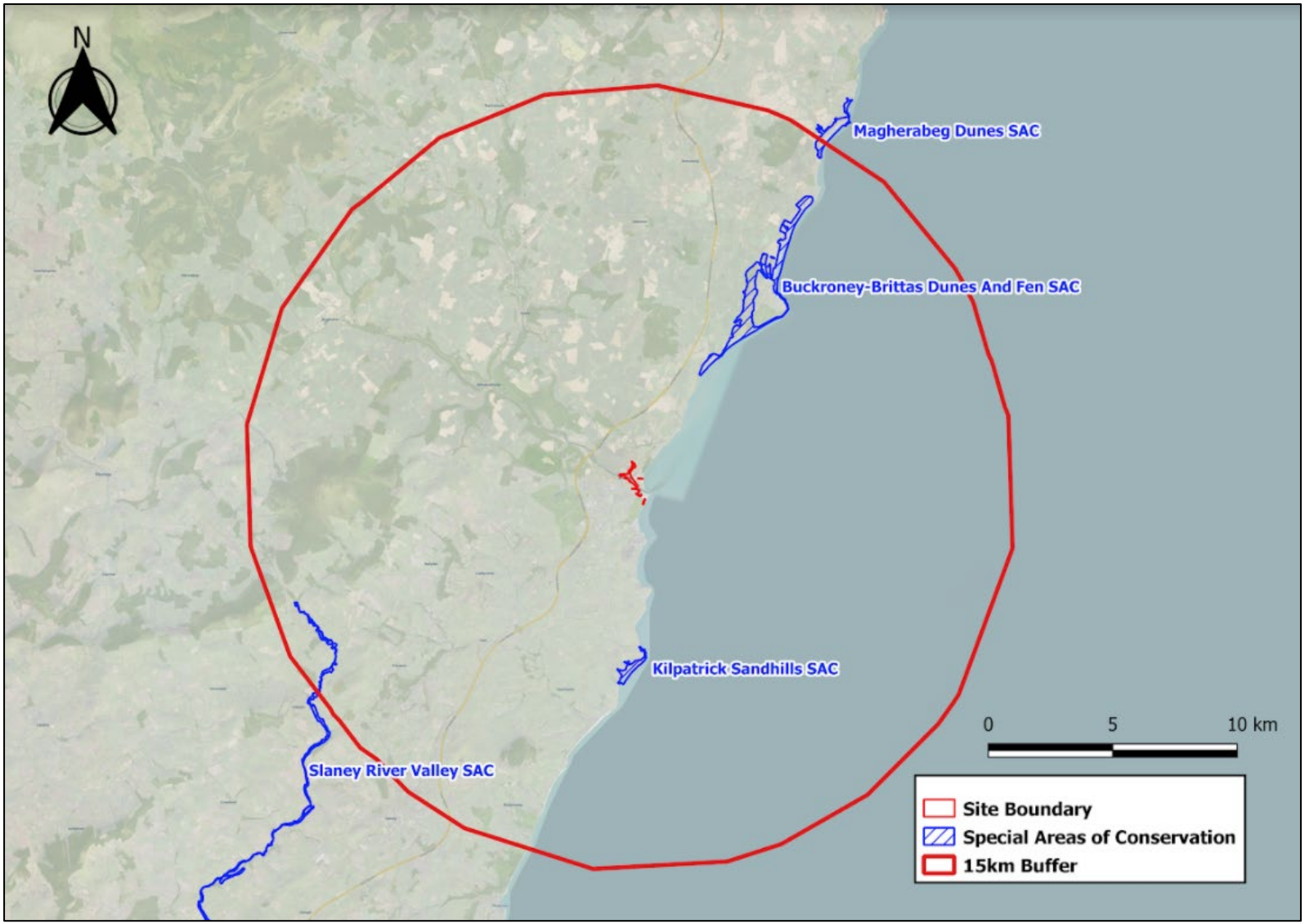


Figure 2-24: SAC with 15km of the proposed development

Table 2.8: Qualifying Interests of SACs within 15km of the proposed development. Potential significant effects to QIs are highlighted in bold.

Buckroney-Brittas Dunes and Fen SAC (NPWS 2017[23])					
Qualifying Interest (*=Priority Habitat)		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex I coastal habitats	Annual vegetation of drift lines [1210]	To maintain the favourable conservation condition	1. Discharges 2. Loss of in-river habitat 3. Noise disturbance 4. Loss of habitat at Arklow Town Marsh pNHA 5. Barrier to faunal movement	No pathway for significant effects	These QIs of the SAC are coastal habitats. The site is located 4.9km as the 'crow flies' north of the proposed development. There are no rivers connecting the SAC to the proposed development area. By sea, the shortest distance of the SAC from the proposed development area is approximately 6.3km. The QIs are located outside of the ZoI of the project impact mechanisms; consequently it is possible to exclude the potential for significant effects at the Screening for AA stage. The QIs and impact mechanism combinations are screened out of further assessment.
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]				
	Dunes with Salix repens ssp. argentea (*Salicion arenariae*) [2170]				
	Mediterranean salt meadows (*Juncetalia maritimae*) [1410]				
	Alkaline fens [7230]				
	Perennial vegetation of stony banks [1220]	To restore the favourable conservation condition			
	Embryonic shifting dunes [2110]				
	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]				
	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) [2150]				
	Humid dune slacks [2190]				
	Mediterranean salt meadows (*Juncetalia maritimae*) [1410]				

[23] NPWS 2017 Conservation Objectives Buckroney-Brittas Dunes and Fen SAC 000729 https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000729.pdf

Kilpatrick Sandhills SAC (NPWS 2017[24])					
Qualifying Interest (*=Priority Habitat)		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex I coastal habitats	Annual vegetation of drift lines [1210]	To maintain the favourable conservation condition	1. Discharges 2. Loss of in-river habitat 3. Noise disturbance 4. Loss of habitat at Arklow Town Marsh pNHA 5. Barrier to faunal movement	No pathway for significant effects	The QIs of the SAC are coastal habitats. The site is located 6.8km as the 'crow flies' south of the proposed development. There are no rivers connecting the SAC to the proposed development area. By sea, the shortest distance of the SAC from the proposed development area is approximately 7.5km. The QIs are located outside of the ZoI of the project impact mechanisms; consequently it is possible to exclude the potential for significant effects at the Screening for AA stage. The QIs and impact mechanism combinations are screened out of further assessment.
	Embryonic shifting dunes [2110]	To restore the favourable conservation condition			
	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]				
	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) [2150]				
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]				

[24] NPWS 2017 Conservation Objectives Kilpatrick Sandhills SAC 0001742 https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO001742.pdf

Slaney River Valley SAC (NPWS 2011[25])					
Qualifying Interest (*=Priority Habitat)		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex I marine/ estuarine/ coastal habitats	Estuaries [1130]	To maintain the favourable conservation condition	1. Discharges 2. Loss of in-river habitat 3. Noise disturbance 4. Loss of habitat at Arklow Town Marsh pNHA 5. Barrier to faunal movement	No pathway for significant effects.	The QIs of the SAC are marine/ estuarine/ coastal habitats. The site is located 13.3km as the 'crow flies' west of the proposed development. There are no rivers connecting the SAC to the proposed development area. By sea, the shortest distance of the SAC from the proposed development area is over 50km. The QIs are located outside of the ZoI of the project impact mechanisms; consequently it is possible to exclude the potential for significant effects at the Screening for AA stage. The QIs and impact mechanism combinations are screened out of further assessment.
	Mudflats and sandflats not covered by seawater at low tide [1140]				
	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	No conservation Objective defined in NPWS 2011.			
	Mediterranean salt meadows (*Juncetalia maritimi*) [1410]				
	*Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]				

[25] NPWS 2011 Conservation Objectives Slaney River Valley SAC 000781 https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO000781.pdf

Slaney River Valley SAC (NPWS 2011)					
Qualifying Interest (*=Priority Habitat)		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex I terrestrial/ freshwater aquatic habitats	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260]	To maintain the favourable conservation condition	1. Discharges 2. Loss of in-river habitat 3. Noise disturbance 4. Loss of habitat at Arklow Town Marsh pNHA 5. Barrier to faunal movement	No pathway for significant effects.	The QIs of the SAC are terrestrial/ freshwater aquatic habitats. The site is located 13.3km as the 'crow flies' west of the proposed development. There are no rivers connecting the SAC to the proposed development area. By sea, the shortest distance of the SAC from the proposed development area is over 50km. The QIs are located outside of the ZoI of the project impact mechanisms; consequently it is possible to exclude the potential for significant effects at the Screening for AA stage. The QIs and impact mechanism combinations are screened out of further assessment.
	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0]	To restore the favourable conservation condition			
	*Alluvial forests with *Alnus glutinosa* and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	To restore the favourable conservation condition			

Slaney River Valley SAC (NPWS 2011)					
Qualifying Interest		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex II marine species	*Phoca vitulina* (Harbour Seal) [1365]	To maintain the favourable conservation condition	1. Discharges 2. Loss of in-river habitat 3. Noise disturbance 4. Loss of habitat at Arklow Town Marsh pNHA 5. Barrier to faunal movement	No pathway for significant effects.	Harbour seal (*Phoca vitulina)* is a resident species commonly found throughout Irish waters. A study undertaken on common seal foraging behaviour indicated that while common seal were site faithful individuals may travel considerable distances (Sharples *et al.,* 2016). The Slaney River Valley SAC supports regionally significant numbers of Common Seal. This Annex II species occurs year-round in Wexford Harbour where several sandbanks are used for breeding, moulting and resting activity. At least 27 Common Seal regularly occur within the site Slaney River Valley SAC. The shortest seal foraging pathway from the Slaney River Valley SAC to the proposed development is approximately 50km. While the Avoca River lies within the foraging range of the harbour seal of the Slaney River Valley SAC, as outlined in **Section 2.3.2.3**, 30 MMO watches, with a total duration of 268 hours of observations, undertaken as part of the Arklow WwTP project did not record marine mammals in the Avoca River, lower estuary of neighbouring coastal waters. In fact the record of harbour seal in the Avoca River area is limited to a single observation of an individual in the lower estuary in 2016 (NBDC). The above clearly indicates that the Avoca River and Arklow FRS development area does not represent an important foraging area for the species. As the area is highly unlikely to support significant number of the species it is possible to exclude the potential for significant effects at the Screening for AA stage. The QI and impact mechanism combinations are screened out of further assessment.

Slaney River Valley SAC (NPWS 2011)					
Qualifying Interest		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex I diadromous fish species	*Alosa fallax* (Twaite Shad) [1103]	To restore the favourable conservation condition	1. Discharges 2. Loss of in-river habitat 3. Noise disturbance 4. Loss of habitat at Arklow Town Marsh pNHA 5. Barrier to faunal movement	No pathway for significant effects.	The normal habitat of this species is the sea, and the lower reaches of large unpolluted rivers where there is easy access to spawning grounds. In general, populations of twaite shad have declined across Europe though not as severely as the allis shad, perhaps due to an ability to use spawning sites close to the sea, often in smaller rivers (Maitland *et al.,* 2003). Spawning takes place upstream to from mid-May to mid-July. In Ireland, although there has been a decline, spawning populations still occur in the rivers Suir, Nore and Barrow, and the Cork Blackwater (Whilde 1993). The species migrates through outer Wexford Harbour into the Slaney River Valley SAC and is confined to the tidal stretches of the SAC (NPWS 2015). Given the location of the project relative to the habitats used by twaite shad there is no risk of significant effects. The QI and impact mechanism combinations are screened out at the Screening for AA stage (the QI is excluded from further assessment.

Slaney River Valley SAC (NPWS 2011)					
Qualifying Interest		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex I diadromous fish species	*Salmo salar* (Salmon) [1106]	To restore the favourable conservation condition	1. Discharges 2. Loss of in-river habitat 3. Noise disturbance 4. Loss of habitat at Arklow Town Marsh pNHA 5. Barrier to faunal movement	No pathway for significant effects.	Salmon spend their juvenile phase in rivers before migrating to sea to grow and mature. To complete their life cycle they return to their river of origin (natal river) to spawn. The upper Slaney and tributary headwaters are very important for spawning (NPWS, 2015). Given the migratory behaviour of the species, salmon from the Slaney River Valley SAC will not occur in the Avoca River area; so it is possible to exclude the potential for significant effects at the Screening for AA stage. The QI and impact mechanism combinations are screened out of further assessment.

Slaney River Valley SAC (NPWS 2011)					
Qualifying Interest		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex I freshwater fish species	*Lampetra planeri* (Brook Lamprey) [1096	To restore the favourable conservation condition	1. Discharges 2. Loss of in-river habitat 3. Noise disturbance 4. Loss of habitat at Arklow Town Marsh pNHA 5. Barrier to faunal movement	No pathway for significant effects.	Brook lamprey is a freshwater species occurring in streams and occasionally in lakes in northwest Europe, particularly in basins associated with the North and Baltic seas. Spawning occurs in the rivers in March and April. Brook lamprey from the Slaney River Valley SAC will not occur in the Avoca River area; so it is possible to exclude the potential for significant effects at the Screening for AA stage. The QI and impact mechanism combinations are screened out of further assessment.

Slaney River Valley SAC (NPWS 2011)					
Qualifying Interest		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex II diadromous fish species	*Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra fluviatilis* (River Lamprey) [1099]	To restore the favourable conservation condition	1. Discharges	No pathway for significant effects.	Unlike salmon, spawning sea lamprey and river lamprey do not home to predetermined natal rivers (philopatric behaviour) (Tuunainen et al., 1980[26]; Bergstedt and Seelye, 1995[27]; Waldman, *et al*., 2008[28]; Meckley, *et al*., 2020[29]). As adults in the marine environment, sea lamprey and river lamprey parasitise various species of marine and anadromous fish (Kelly and King, 2001[30]). After the parasitic phase, which lasts between 2 – 3 years, river lamprey and sea lamprey migrate upstream to spawn, selecting rivers and streams through positive rheotaxis (swimming into an oncoming current) and attraction to pheromonal cues (bile acids) from larval conspecifics located upstream (Tuunainen et al., 1980; Bergstedt and Seelye, 1995; Waldman, *et al*., 2008; Meckley, *et al*., 2020). Lamprey spawning habitat requires a gravel bottom with swift-running water and nearby sheltered areas with muddy bottoms for the larvae (Wheeler 1969[31]). Once in the vicinity of spawning gravels, they hide under stones or among vegetation (Hardisty and Potter 1971[32]), with sea lamprey congregating at spawning gravels to spawn in May and

[26] Tuunainen, P., Ikonen, E., Auvinen, H. 1980. Lampreys and lamprey fisheries in Finland. Canadian Journal of 506 Fisheries and Aquatic Sciences 37: 1953-1959.

[27] Bergstedt, R.A., Seelyem J.G 1995. Evidence for Lack of Homing by Sea Lampreys. Transactions of the American Fisheries Society 24:235-239

[28] Waldman, J., Grunwald, C., Wirgin, I. 2008. Sea lamprey *Petromyzon marinus*: an exception to the rule of homing in anadromous fishes. Evolutionary Biology. Biology Letters. 2008 4: 659–662

[29] Meckley, T.D., Wagner, C.M., Gurarie, E. 2014. Coastal movements of migrating sea lamprey (*Petromyzon marinus*) in response to a partial pheromone added to river water: implications for management of invasive populations. Canadian Journal of Fisheries and Aquatic Sciences 71(4)

[30] Kelly, F.L., King, J.J. 2001 A Review of the Ecology and Distribution of Three Lamprey Species, *Lampetra fluviatilis* (L.), *Lampetra planeri* (Bloch) and *Petromyzon marinus* (L.): A Context for Conservation and Biodiversity Considerations in Ireland.

[31] Wheeler, A. 1969 The fishes of the British Isles and northwestern Europe. 613pp. London. MacMillan.

[32] Hardisty MW & Potter IC (1971). The biology of lampreys. Academic Press, London

					June, and river lamprey spawning in March and April (Kelly and King, 2001). Hatching occurs two weeks after egg deposition and within a further one to three weeks the ammocoete larvae emerge from the spawning substrate and pass downstream, where they burrow into muddy beds in sheltered areas. Ammocoetes (larvae) are relatively immobile and remain in the muddy beds for between 3 – 8 years (Kelly and King, 2001; Dawson *et al*., 2015[33]). The population of larvae present in the muddy beds, which comprise multiple age classes, filter feed on organic matter until the onset of metamorphosis (Dawson *et al*., 2015). Larvae metamorphose into non-feeding adults that migrate downstream to the marine environment. Given the non-philopatric behaviour of sea lamprey and river lamprey, there is potential that adults originating from any river system including the Slaney may migrate into the Avoca River and move upstream to spawn. Similarly, adults derived from lamprey ammocoete populations of the Avoca River may be recruited into any river system including the Slaney. It is noted, however, that it is unlikely that lamprey migrating through the development area will be significantly affected by sediments released to the river area during construction phase activities (*i.e.* excavation work, capital dredging operations) and operation phase activities (*i.e.* maintenance dredging operations) as the species have evolved to migrate through estuaries which are naturally high in turbidity and the species have evolved mechanisms to deal with high suspended sediment loads. It should be further noted that if effects to lamprey from discharges are realised, given the timing and duration of excavation and dredging activities, the effects will be limited to a single year cohort of adults migrating downstream through the development area to recruit to the marine population, and a single year cohort of adults migrating upstream through the development area to spawn.

[33] Dawson H., Quintella B., Almeida P., Treble A., Jolley J. (2015) The Ecology of Larval and Metamorphosing Lampreys. In: Docker M. (eds) Lampreys: Biology, Conservation and Control. Fish & Fisheries Series, vol 37. Springer, Dordrecht. https://doi.org/10.1007/978-94-017-9306-3_3

					Marine populations of lamprey comprise recruits from multiple river systems and multiple year classes. Any reduction in the number of adults from the Avoca recruiting to the marine population during construction phase and operational phase activities will not have a significant effect on population levels. Populations of ammocoetes within upstream muddy beds comprise multiple age classes (Kelly and King, 2001; Dawson *et al*., 2015). Any reduction in the number of adults migrating upstream to spawn in the Avoca River during construction phase and operational phase activities to spawn will not have a significant effect on larvae population levels. Based on the above, significant effects to lamprey populations of the Slaney River Valley SAC can be screened out at the Screening for AA stage. The QI and impact mechanism combinations are screened out of further assessment.

Slaney River Valley SAC (NPWS 2011)					
Qualifying Interest		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex II diadromous fish species	*Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra fluviatilis* (River Lamprey) [1099]	To restore the favourable conservation condition	2. Loss of in-river habitat	No pathway for significant effects.	Before and during migration, lamprey effectively cease to feed. Consequently, during the period of several days to weeks that '*migratory fish hold up in tidal water before running up into the clear water above on a flood'* the habitats of the lower Avoca do not represent important foraging areas (O'Reilly 2009). Consequently, effects on foraging success in migratory fish can be excluded. While the proposed Arklow FRS development will result in loss of some in-river habitat, the loss is small relative to the area available to fish as a migration corridor; consequently, the risk of a significant effect to the QIs can be excluded at the Screening for AA stage. The QIs and impact mechanism combinations are screened out of further assessment.

Slaney River Valley SAC (NPWS 2011)					
Qualifying Interest		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex II diadromous fish species	*Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra fluviatilis* (River Lamprey) [1099]	To restore the favourable conservation condition	3. Noise disturbance	No pathway for significant effects.	Noise is readily transmitted underwater and there is potential that that lamprey fish species moving/ migrating through the project area may be present during construction and maintenance activities. Sound is perceived by fish through the ears and the lateral line (the acoustico-lateralis system) which is sensitive to vibration. Some species of fish such as have a structure linking the gas filled swim bladder to the ear. The swim bladder is sensitive to the pressure component of a sound wave, which resonates as a signal that stimulates the ears. These species, therefore, usually have increased hearing sensitivity. Such species are considered to be more sensitive to anthropogenic underwater noise sources than species, such as lamprey that do not possess a structure linking the swim bladder and inner ear. While there are no data available for hearing in lamprey, it is highly unlikely that they detect sound close to 10 kHz (Popper, 2005[34]). The lamprey ear is relatively simple and there is nothing within the structure of the ear or associated structures to suggest any specialisations that would make them into anything but a hearing generalist, with maximum hearing to no more than several hundred Hz. Noise disturbance can result in auditory injury and behaviour changes. Exposure to high energy noise emissions (piling, drilling, seismic noise) can result in recoverable auditory injury (termed Temporary Threshold Shift [TTS]) and non-recoverable auditory injury (termed Permanent Threshold Shift [PTS]). Behavioural reactions to acoustic exposure are generally more variable, context-dependent, and less predictable than the effects of noise exposure on hearing or physiology. This is because behavioural responses to anthropogenic sound are dependent upon operational and environmental variables, and on the physiological, sensory, and psychological characteristics of exposed animals. It should be noted that the potential impact of noise on fish in open water are considered to be minimal as they can readily move away from the noise source (Popper 2005). Experiments on fry demonstrated balance problems resulting from

[34] Popper, A.N. (2005). A review of hearing by sturgeon and lamprey. Prepared for U.S. Army Corps of Engineers by Environmental Bioacoustics LLC.

Slaney River Valley SAC (NPWS 2011)					
Qualifying Interest		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
					exposure to an energy source, however, the effects were temporary with full recovery observed after a few minutes upon cessation of the noise (Kostyuchenko, 1971 (cited in McCauley 1994[35]). Some studies of high energy seismic noise sources have also demonstrated fish's ability to acclimatise to noise associated with an energy source over time (*e.g.* Chapman and Hawkins, 1969[36]). Prolonged exposure of individual fish to injurious noise from construction noise and vibration is unlikely occur as fish are unlikely to stay in the vicinity noise sources; consequently, the risk of a significant effect to the QIs can be excluded at the Screening for AA stage. The QIs and impact mechanism combinations are screened out of further assessment

[35] McCauley, R.D (1994) Seismic surveys. In: Swan, J.M.; Neff, J.M.; Young, P.C., (Eds.) Environmental Implications of Offshore Oil and Gas Development in Australia - The findings of an Independent Scientific Review. APEA, Sydney

[36] Chapman CJ; Hawkins AD (1969) The importance of sound in fish behaviour in relation to capture by trawls. FAO Fisheries Report 62 717-729

Slaney River Valley SAC (NPWS 2011)					
Qualifying Interest		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex II diadromous fish species	*Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra fluviatilis* (River Lamprey) [1099]	To restore the favourable conservation condition	4. Loss of habitat at Arklow Town Marsh pNHA	No pathway for significant effects.	See Source-Pathway-Receptor Assessment for Impact Mechanism 2. Loss of in-river habitat The QIs and impact mechanism combinations are screened out of further assessment.
Annex II diadromous fish species	*Petromyzon marinus* (Sea Lamprey) [1095] *Lampetra fluviatilis* (River Lamprey) [1099]	To restore the favourable conservation condition	5. Barrier to faunal movement	No pathway for significant effects.	The debris trap located approximately 300m upstream of Arklow Bridge will extend 45 – 50 m across the river from the north to the south banks of the river. It will be constructed of RC columns founded at a suitable formation level and rising to 500mm above design flood level. The columns are roughly 2.5m or more apart and will not obstruct fish movements. The gravel trap located approximately 10m upstream of the debris trap extends across the width of the river. The gravel trap comprises a trough and will not obstruct fish movements; consequently the risk of a significant effect to the movement of the QIs can be excluded at the Screening for AA stage. No potential significant effect to the QIs. The QIs and impact mechanism combinations are screened out of further assessment.

Slaney River Valley SAC (NPWS 2011)					
Qualifying Interest		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex II aquatic mammal species	*Lutra* (Otter) [1355]*	To restore the favourable conservation condition	1. Discharges	No pathway for significant effects.	Otter is an aquatic mammal species. The site is located 13.3km west of the proposed development. While there are no rivers connecting the SAC to the proposed development area, there is potential that otter of the SAC may migrate into the project area and thereby be affected. NBDC database includes a sighting of the otter in the Avoca River at Arklow Bridge. The release of sediments in the water column during excavation and construction and the resuspension of sediments during dredging has the potential to significantly affect turbidity levels. Otter is a highly mobile species and while their eyes are adapted for seeing food item in murky or dark water, they will avoid areas of excessive turbidity. While significant increases in turbidity may result in the temporary displacement of the species, there are extensive alterative areas of otter habitat available to the species away from the project area. Consequently, there is no risk of significant effects (the QI and impact mechanism combination is excluded from further assessment).
Annex II aquatic mammal species	*Lutra* (Otter) [1355]*	To restore the favourable conservation condition	2. Loss of in-river habitat	No pathway for significant effects.	While the proposed Arklow FRS development will result in loss of some in-river habitat, the loss is small relative to the area available to otter; consequently, it can be concluded that there will be no potential significant effect to the QIs. The QIs and impact mechanism combinations are screened out of further assessment.

Slaney River Valley SAC (NPWS 2011)					
Ecological Group	**Qualifying Interest (*=Priority Habitat)**	**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex II aquatic mammal species	*Lutra* (Otter) [1355]*	To restore the favourable conservation condition	3. Noise disturbance	No pathway for significant effects.	Otters are quite tolerant of human disturbance and are often recorded in urban areas. Otter are mainly active in the early morning and/ or late evening. Given this behaviour, it is unlikely that the species will be active in the project area during operations and encounter rates will be low; consequently, significant disturbance effects will not occur. It is possible that while ongoing, construction activity will deter otter from foraging in the immediate project area. It should be noted however that given the general daylight timing of construction activities, any disturbance resulting in displacement of the species will be temporary and short lived and will not result in significant effects. In addition, there are extensive alterative areas of otter habitat available to the species away from the project area. The risk of a significant effect to otter can be excluded; the QI and impact mechanism combination is screened out of further assessment.
Annex II aquatic mammal species	*Lutra* (Otter) [1355]*	To restore the favourable conservation condition	4. Loss of habitat at Arklow Town Marsh pNHA	No pathway for significant effects.	Surveys at the marsh areas did not report otter holts or evidence of otter activity. No potential pathway for interaction exists between the impact mechanisms and the QI, significant effects are excluded (*i.e.* no connectivity exists). The risk of a significant effect to otter can be excluded; the QI and impact mechanism combination is screened out of further assessment.
Annex II aquatic mammal species	*Lutra* (Otter) [1355]*	To restore the favourable conservation condition	5. Barrier to faunal movement	No pathway for significant effects.	The debris trap located approximately 300m upstream of Arklow Bridge will extend 45 – 50 m across the river from the north to the south banks of the river. It will be constructed of RC columns founded at a suitable formation level and rising to 500mm above design flood level. The columns are roughly 2.5m or more apart and will not obstruct otter movements. The gravel trap located approximately 10m upstream of the debris trap extends across the width of the river. The gravel trap comprises a trough and will not obstruct otter movements. The risk of a significant effect to otter can be excluded; the QI and impact mechanism combination is screened out of further assessment.

Magherabeg Dunes SAC (NPWS 2017[37])					
Ecological Group	**Qualifying Interest (*=Priority Habitat)**	**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex I coastal habitats	Annual vegetation of drift lines [1210]	To maintain the favourable conservation condition	1. Discharges 2. Loss of in-river habitat 3. Noise disturbance 4. Loss of habitat at Arklow Town Marsh pNHA 5. Barrier to faunal movement	No pathway for significant effects.	The QIs of the SAC are coastal habitats. The site is located 14.8km south of the proposed development. The QIs are located outside of the ZoI of the project impact mechanisms; consequently it is possible to exclude the potential for significant effects. The QIs and impact mechanism combinations are screened out of further assessment.
	Embryonic shifting dunes [2110]				
	Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) [2120]				
	Atlantic decalcified fixed dunes (*Calluno-Ulicetea*) [2150]				
	Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130]	To restore the favourable conservation condition			
Annex II freshwater habitats	Petrifying springs with tufa formation (*Cratoneurion*)				

[37] NPWS 2017 Conservation Magherabeg Dunes SAC 001766 https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO001766.pdf

2.4.3.3. Conservation Features of Distant European Sites

As described in **Section 2.3.2,** a range of protected mobile species designated for distant SPAs and SACs have been recorded in the proposed development area. Consequently, there is potential that the species may be affected by the proposed development (*i.e.* potential *ex situ* effects).

2.4.3.4. SCIs of Distant SPAs

As outlined in **Section 2.3.2.1,** bird surveys undertaken in the area and records from the NBDC indicate 24 protected SCI bird species designated for SPAs have been recorded in the Arklow FRS development area and the adjacent Arklow Town Marsh pNHA[38]; consequently, there is potential for *ex situ* effects to the species. The SCI species can be assigned to ten broad feeding guilds after Weller (1999[39]). The feeding guilds and SCI species are:

1. Surface swimmer/ Water column diver (shallow)/ Terrestrial walker
    - A125 Coot (*Fulica atra*)
2. Surface swimmer/ Water column diver (shallow)
    - A004 Little Grebe (*Tachybaptus ruficollis*)
3. Surface swimmer/ Water column diver (shallow)/ Intertidal walker (out of and in water) / Terrestrial walker
    - A183 Lesser Black-backed Gull (*Larus fuscus*)
    - A184 Herring Gull (*Larus argentatus*)
    - A179 Black-headed Gull (*Chroicocephalus ridibundus*)
    - A182 Mew Gull (*Larus canus*)
4. Surface swimmer/ Intertidal walker (out of water)
    - A050 Wigeon (*Anas penelope*)
5. Surface swimmer/ Terrestrial walker
    - A043 Greylag Goose (*Anser anser*)
6. Terrestrial walker
    - A395 Greenland White-fronted Goose (*Anser albifrons flavirostris*)
7. Water column diver (deeper)
    - A017 Cormorant (*Phalacrocorax carbo*)

[38] http://maps.biodiversityireland.ie (accessed 15/03/2021)

[39] Weller MW. 1999. Wetland birds. Habitat resources and conservation implications. Cambridge, UK: Cambridge Univ. Press.

- A001 Red-throated Diver (*Gavia stellata*)

8. Water column diver (shallow)

- A067 Goldeneye (*Bucephala clangula*)
- A229 Kingfisher (*Alcedo atthis*)

9. Intertidal walker (in and out of water)

- A160 Curlew (*Numenius arquata*)
- A130 Oystercatcher (*Haematopus ostralegus*)
- A140 Golden Plover (*Pluvialis apricaria*)
- A137 Ringed Plover (*Charadrius hiaticula*)
- A142 Lapwing (*Vanellus vanellus*)
- A028 Grey Heron (*Ardea cinerea*)
- A169 Turnstone (*Arenaria interpres*)

10. Surface swimmer – dabbling ducks

- A053 Mallard (*Anas platyrhynchos*)
- A052 Teal (*Anas crecca*)
- A059 Pochard (*Aythya ferina*)
- A061 Tufted Duck (*Aythya fuligula*)

The Irish SPAs for which the SCI species are designated are listed **Table 2.9** through **Table 2.18** alongside the distance of the site to the development area. For the SCI birds comprising the feeding guilds, **Table 2.9** through **Table 2.18** present screening exercises of the potential direct and indirect effects of the project. The screening exercises consider the likelihood of the SCI species from the SPAs to occur in the Arklow FRS development area and thereby be affected by the project. The project impact mechanism of concern are: 1. Discharges, 2. Loss of in-river habitat and 4. Loss of habitat at Arklow Town Marsh pNHA. Potential direct project effects to SCIs include the loss of important roosting and foraging habitats, while project discharges (including sediment laden water, and runoff chemicals or other waste material pollution) may indirectly impact bird foraging success by reducing food availability.

For convenience, the SCI species and their SPA sites that are screened in for further detailed consideration of the potential for effects are summarised in **Table 2.19**.

Table 2.9: Surface swimmer/ Water column diver (shallow)/ Terrestrial walker

Coot *(Fulica atra)*

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Wexford Harbour and Slobs SPA (004076)	44.6	Coot is omnivorous, although its diet consists primarily of vegetable matter such as algae (*e.g. Chara, Cladophora, Spirogyra*) and the vegetative parts of aquatic and terrestrial plants. The species inhabits large, still or slow-flowing waters and shows a preference for shallow water with adjacent deeper water (*e.g.* > 2 m) for diving, and muddy substrates, marginal, emergent, floating or submergent vegetation. The species does not undergo extensive foraging journeys and will remain largely faithful to the SPA sites. Given that the species does not undergo extensive foraging journeys and the significant distances of the SPAs from the development area (minimum distance of 44.6km), the potential for individuals from the SPAs occurring in the development area is low; consequently the risk of significant effects to the SCI populations of the SPAs can be excluded. Potential significant *ex situ* effects to the SCI species of the SPAs from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
Tacumshin Lake SPA (004092)	69.3	
Lough Ennell SPA (004044)	110.1	
Lough Owel SPA (004047)	116.9	
Lough Derravarragh SPA (004043)	118.2	
Lough Iron SPA (004046)	123.3	
Lough Ree SPA (004064)	140.1	
Lough Rea SPA (004134)	167.0	
Ballyallia Lough SPA (004041)	190.2	
Lough Corrib SPA (004042)	201.6	
The Gearagh SPA (004109)	217.6	
Lough Swilly SPA (004075)	258.6	

Table 2.10: Surface swimmer/ Water column diver (shallow)

Little Grebe (*Tachybaptus ruficollis*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Wexford Harbour and Slobs SPA	44.6	Little Grebe inhabit a wide range of small and shallow wetlands usually less than 1 m deep with rich vegetation and high densities of aquatic invertebrates, generally avoiding waters with large predatory fish. Suitable habitats include small lakes, ponds, the sheltered bays and vegetated shores of larger freshwater, alkaline or saline lakes and reservoirs, slow-flowing rivers, canals flood-plain oxbows, coastal brackish lagoons, seasonally inundated areas, swamps. Outside of breeding season it is common on more open waters and is occasionally observed along the coast in estuaries or sheltered bays protected from strong wave action. Diet consists predominantly of adult and larval insects, especially mayflies, stoneflies, water bugs, beetles, flies, caddisflies and dragonflies, as well as molluscs, crustaceans, adult and juvenile amphibians and occasionally small fish during the winter. Typically observed along the coast in estuaries or sheltered bays protected from strong wave action. While the development area supports limited areas of habitat that can be used by the species, The species does not undergo extensive foraging journeys, and given the significant distances of the SPAs from the development area (minimum distance of 44.6km), the potential for large numbers of individuals from the SPAs occurring in the development area is low; consequently the risk of significant effects to the SCI populations of the SPAs can be excluded. Potential significant *ex situ* effects to the SCI species of the SPAs from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
Tacumshin Lake SPA	69.3	
Lough Ree SPA	140.1	
Cork Harbour SPA	169.9km	
Corofin Wetlands SPA	192.6	
Lough Arrow SPA	197.9	

Table 2.11: Surface swimmer/ Water column diver (shallow)/ Intertidal walker (out of and in water) / Terrestrial walker

Lesser Black-backed Gull (*Larus fuscus*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Poulaphouca Reservoir SPA (004063)	**41.2**	Lesser Black-backed Gull breeds in colonies, showing a preference for level-ground that is well covered with fairly close, short vegetation, often nesting under heather, bracken or other vegetation (sometimes under pine trees). Suitable sites include flat, unbroken grassy slopes, sand-dunes, the tops and ledges of coastal cliffs, rocky offshore islands, saltmarshes, the margins of inland lakes, islands in lakes and rivers, and high moorland, although the species will also nest on buildings and rooftops. Outside of the breeding season the species chiefly inhabits inshore and offshore seas, as well as lagoons, estuaries, harbours and seashores. It may also frequent inland habitats during this season, such as large lakes and rivers. The species is an omnivorous, opportunistic feeder that forages extensively at sea. Its diet consists of small fish, aquatic and terrestrial invertebrates (*e.g.* beetles, flies and larvae, ants, moths, grasshoppers, crustaceans, molluscs, segmented worms and starfish), bird eggs and nestlings, carrion, offal, rodents, berries and grain. It often follows fishing fleets, feeding on discarded bycatch. The species which has a broad and varied feeding ecology has a foraging distance of up to 181km (Thaxter *et al*., 2012). Seven SPAs (highlighted in **bold** in column 1 opposite) are located within the foraging range of the species. Given the forging range of the species there is potential that individuals from these SPAs may occur in the development area; consequently, likely significant *ex situ* effects from development cannot be excluded at the Screening for AA stage. The SCI and SPAs are screened in as requiring further detailed consideration of the potential for effects (see **Section 3 Stage 2 AA NIS**). The SPAs brought forward to **Section 3** are highlighted in **bold** in column 1 opposite.
Wexford Harbour and Slobs SPA (004076)	**44.6**	
Lambay Island SPA (004069)	**75.9**	
Saltee Islands SPA (004002)	**78.2**	
Ballymacoda Bay SPA (004023)	**152.6**	
Ballycotton Bay SPA (004022)	**163.8**	
Cork Harbour SPA (004030)	**169.9**	
Lough Mask SPA (004062)	227.6	
Lough Derg (Donegal) SPA (004057)	229.8	
Inishbofin, Inishdooey and Inishbeg SPA (004083)	294.5	
Deenish Island and Scariff Island SPA (004175)	300.8	
Blasket Islands SPA (004008)	304.9	
Inishglora and Inishkeeragh SPA (004084)	306.1	
Puffin Island SPA (004003)	308.3	

Herring Gull (Larus argentatus)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Ireland's Eye SPA (004117)	**66.4**	Herring Gull inhabits coastal and near-coastal areas but may also forage inland on large lakes and reservoirs, fields and refuse dumps. It has no specific breeding habitat but may show a preference for rocky shores with cliffs, outlying stacks or islets, otherwise nesting on rocky and grassy islands, sandy beaches, gravel bars, saltmarshes, rocky outcrops, buildings. When inland on migration the species also shows a preference for large river valleys. The species has a highly opportunistic diet and will exploit almost any superabundant source of food. It takes fish, earthworms, crabs and other marine invertebrates (*e.g.* molluscs, starfish or marine worms), adult birds, bird eggs and young, rodents, insects (e.g. ants), berries and tubers. It also scavenges at refuse dumps, fishing wharves and sewage outfall zones and frequently follows fishing boats. The species which has a broad and varied feeding ecology has a foraging distance of up to 92km (Thaxter *et al*., 2012). Three SPAs (highlighted in **bold** in column 1 opposite) are located within the foraging range of the species. Given the forging range of the species there is potential that individuals from these SPAs may occur in the development area; consequently, likely significant *ex situ* effects from development cannot be excluded at the Screening for AA stage. The SCI and SPAs are screened in as requiring further detailed consideration of the potential for effects (see **Section 3 Stage 2 AA NIS**). The SPAs brought forward to **Section 3** are highlighted in **bold** in column 1 opposite.
Saltee Islands SPA (004002)	**78.2**	
Skerries Islands SPA (004122)	**85.4**	
River Nanny Estuary and Shore SPA (004158)	94.6	
Mid-Waterford Coast SPA (004193)	100.7	
Dundalk Bay SPA (004026)	118.2	
Helvick Head to Ballyquin SPA (004192)	125.1	
Lough Derg (Donegal) SPA (004057)	229.8	
Inishmurray SPA (004068)	254.7	
West Donegal Coast SPA (004150)	257.4	
Lough Foyle SPA (004087)	262.2	
Roaninish SPA (004121)	278.1	
West Donegal Islands SPA (004230)	291.5	
Inishkea Islands SPA (004004)	304.7	
Blasket Islands SPA (004008)	304.9	
Inishglora and Inishkeeragh SPA (004084)	306.1	

Black-headed Gull (*Chroicocephalus ridibundus*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
The Murrough SPA (004186)	**21.3**	Black-headed Gull diet consists predominantly of aquatic and terrestrial insects, earthworms and marine invertebrates (*e.g.* molluscs, crustaceans and marine worms) although it may also take fish (usually dead or sick), rodents (*e.g.* voles) and agricultural grain. During the non-breeding season the species may rely heavily on artificial food sources provided by man and often scavenges from refuse tips during this period. The species has a foraging distance of up to 40km (Thaxter *et al*., 2012). The Murrough SPA (004186) is located within the foraging range of the species and there is potential that individuals from the SPA may occur in the development area; consequently, likely significant *ex situ* effects from development cannot be excluded at the Screening for AA stage. The SCI and SPA is screened in as requiring further detailed consideration of the potential for effects (see **Section 3 Stage 2 AA NIS**). The SPAs brought forward to **Section 3** are highlighted in **bold** in column 1 opposite.
Wexford Harbour and Slobs SPA (004076)	44.6	
South Dublin Bay and River Tolka Estuary SPA (004024)	55.1	
North Bull Island SPA (004006)	60.5	
Lady's Island Lake SPA (004009)	66.9	
Dundalk Bay SPA (004026)	118.2	
River Little Brosna Callows SPA (004086)	127.7	
Middle Shannon Callows SPA (004096)	129.2	
Ballymacoda Bay SPA (004023)	152.6	
River Shannon and River Fergus Estuaries SPA (004077)	168.5	
Cork Harbour SPA (004030)	169.9	
Inner Galway Bay SPA (004031)	188.5	
Lough Corrib SPA (004042)	201.6	
Courtmacsherry Bay SPA (004219)	213.8	
Lough Mask SPA (004062)	227.6	
Tralee Bay Complex SPA (004188)	249.6	
Lough Swilly SPA (004075)	258.6	
Lough Foyle SPA (004087)	262.2	
Greers Isle SPA (004082)	287.1	
Dundalk Bay SPA (004026)	118.2	
Ballymacoda Bay SPA (004023)	152.6	

A182 Common (or Mew) Gull (*Larus canus*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Ballycotton Bay SPA (004022)	163.8	Common (or Mew) Gull species diet consists of earthworms, insects, aquatic and terrestrial invertebrates crayfish and molluscs and small fish. On the coast it nests on grassy and rocky cliff-ledges, grassy slopes, inshore rocky islets, islands and stacks, and on sand and shingle beaches, banks and dunes amongst tide-wrack or flood debris Inland the species nests on small islands in freshwater and saline lakes, shingle bars or small islets in streams or rivers islets, artificial structures and shores of artificial waterbodies with short, sparse vegetation. Common gull is reported to have a foraging distance of 50km (Thaxter *et al.*, 2012). SPAs designated for the species are located over 163.8km for the development area and outside of the foraging range of the species. While the development area may provide foraging opportunities for the species, given the foraging distance of the species it is unlikely that large numbers of individuals from the SPAs will not occur in the development area; consequently there is no risk of significant effects to the SPA. Potential significant *ex situ* effects to the SCI species of the SPAs from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
Cork Harbour SPA (004030)	169.9	
Inner Galway Bay SPA (004031)	188.5	
Lough Corrib SPA (004042)	201.6	
Courtmacsherry Bay SPA (004219)	213.8	
Connemara Bog Complex SPA (004181)	218.8	
Lough Carra SPA (004051)	226.9	
Lough Mask SPA (004062)	227.6	
Lough Conn and Lough Cullin SPA (004228)	237.3	
Tralee Bay Complex SPA (004188)	249.6	
Lough Swilly SPA (004075)	258.6	
Magharee Islands SPA (004125)	259.8	
Lough Foyle SPA (004087)	262.2	
Clare Island SPA (004136)	276.2	
Greers Isle SPA (004082)	287.1	
West Donegal Islands SPA (004230)	291.5	
Inishbofin, Inishdooey and Inishbeg SPA (004083)	294.5	
Inishtrahull SPA (004100)	300.4	
Inishkea Islands SPA (004004)	304.7	

Table 2.12: Surface swimmer/ Intertidal walker (out of water)

Wigeon (*Anas penelope*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
The Murrough SPA (004186)	**21.3**	Wigeon is vegetarian and consumes the leaves, seeds, stems and root bulbs of pond weeds, fine grasses. Mainly uses grassland, wetlands (inland), marine neritic, marine intertidal, marine coastal/supratidal. The development area supports areas of habitat that can be used by the species for foraging. The species which is a gregarious flock forming species undertake limited foraging journeys and there is potential that individuals from four SPAs (highlighted in **bold** in column 1 opposite) may occur in relatively large numbers in the development area; consequently, likely significant *ex situ* effects from development cannot be excluded at the Screening for AA stage. The SCI and SPA is screened in as requiring further detailed consideration of the potential for effects (see **Section 3 Stage 2 AA NIS**). The SPAs brought forward to **Section 3** are highlighted in **bold** in column 1 opposite.
Cahore Marshes SPA (004143)	**27.1**	
Wexford Harbour and Slobs SPA (004076)	**44.6**	
Tacumshin Lake SPA (004092)	**69.3**	
Lough Iron SPA (004046)	123.3	
River Little Brosna Callows SPA (004086)	127.7	
Middle Shannon Callows SPA (004096)	129.2	
River Suck Callows SPA (004097)	138.2	
Lough Ree SPA (004064)	140.1	
Blackwater Callows SPA (004094)	141.8	
Blackwater Estuary SPA (004028)	145.1	
Ballymacoda Bay SPA (004023)	152.6	
Lough Oughter Complex SPA (004049)	155.9	
River Shannon and River Fergus Estuaries SPA (004077)	168.5	
Cork Harbour SPA (004030)	169.9	
Rahasane Turlough SPA (004089)	180.6	
Inner Galway Bay SPA (004031)	188.5	
Ballyallia Lough SPA (004041)	190.2	
Corofin Wetlands SPA (004220)	192.6	
Courtmacsherry Bay SPA (004219)	213.8	
The Gearagh SPA (004109)	217.6	
Tralee Bay Complex SPA (004188)	249.6	
Castlemaine Harbour SPA (004029)	255.1	
Lough Swilly SPA (004075)	258.6	
Lough Foyle SPA (004087)	262.2	

Table 2.13: Surface swimmer/ Terrestrial walker

Greylag Goose (*Anser anser*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
The Murrough SPA (004186)	21.3	In the winter, Greylag Goose inhabit lowland farmland in open country, swamps, lakes, reservoirs, coastal lagoons and estuaries. The species is herbivorous, its diet consisting of grass, the roots, shoots, leaves, stems, seedheads and fruits of other herbaceous marsh vegetation, aquatic plants, and agricultural grain and potatoes (especially in the winter). The species does not undergo significant foraging journeys and will remain largely faithful to the SPA sites feeding within the sites and immediate surrounding hinterland. Given this behaviour it can be concluded that the species from the SPAs with not occur in large numbers (if at all) in the development area; consequently, there is no risk of significant effects to the SPA populations. Potential significant *ex situ* effects to the SCI species of the SPAs from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
Poulaphouca Reservoir SPA (004063)	41.2	
Lambay Island SPA (004069)	75.9	
Rogerstown Estuary SPA (004015)	76.6	
Dundalk Bay SPA (004026)	118.2	
Stabannan-Braganstown SPA (004091)	121.2	
Lough Swilly SPA (004075)	258.6	
Lough Foyle SPA (004087)	262.2	

Table 2.14: Terrestrial walker

Greenland White-fronted Goose *(Anser albifrons flavirostris)*

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Cahore Marshes SPA (004143)	27.1	Species winters in open country on agricultural land, improved grassland, stubble fields, and wet meadows or in brackish and freshwater marshy habitats such as upland bogs, peatlands and floodlands. It may also roost on tidal marshes, in sheltered bays or in estuaries and frequents inland lakes. The species is herbivorous, its diet consisting of the roots, leaves, stems, seeds and fruits of terrestrial plants such as herbs, grasses and sedges, as well as agricultural grain, wheat, and barley, potatoes and sprouting cereals (especially in the winter). Like Greylag Goose (*Anser anser*), Greenland White-fronted Goose species will be largely faithful to the sites. The species will not move far beyond suitable feeding sites within the SPA sites and immediate surrounding lands. Given this behaviour it can be concluded that the species from the SPAs with not occur in large numbers (if at all) in the development area; consequently there is no risk of significant effects to the SPA. Potential significant *ex situ* effects to the SCI species of the SPAs from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
The Raven SPA (004019)	42.5	
Wexford Harbour and Slobs SPA (004076)	44.6	
Lough Iron SPA (004046)	123.3	
Garriskil Bog SPA (004102)	127.7	
River Little Brosna Callows SPA (004086)	127.7	
All Saints Bog SPA (004103)	127.9	
Mongan Bog SPA (004017)	133.5	
River Suck Callows SPA (004097)	138.2	
Lough Croan Turlough SPA (004139)	154.8	
Ballykenny-Fisherstown Bog SPA (004101)	155	
Four Roads Turlough SPA (004140)	159.6	
Rahasane Turlough SPA (004089)	180.6	
Bellanagare Bog SPA (004105)	188.8	
Cregganna Marsh SPA (004142)	191.7	
Lough Gara SPA (004048)	195.3	
Lough Corrib SPA (004042)	201.6	
Lough Mask SPA (004062)	227.6	
Pettigo Plateau Nature Reserve SPA (004099)	232.4	
Lough Conn and Lough Cullin SPA (004228)	237.3	
Durnesh Lough SPA (004145)	237.7	
Killarney National Park SPA (004038)	242.3	
Lough Nillan Bog SPA (004110)	255.1	
Eirk Bog SPA (004108)	257.4	

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Lough Swilly SPA (004075)	258.6	
Sheskinmore Lough SPA (004090)	268.4	
Horn Head to Fanad Head SPA (004194)	280.6	
Termoncarragh Lake and Annagh Machair SPA (004093)	303.8	

Table 2.15: Water column diver (deeper)

Cormorant (*Phalacrocorax carbo*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
The Raven SPA (004019)	42.5	Typically found in coastal/ marine waters. Diet consists predominantly of fish, including as well as crustaceans, amphibians, molluscs and nestlings. At sea, the species preys mostly on bottom-dwelling fish, occasionally also taking shoaling fish in deeper waters. It is a generalist, known to feed on at least 22 different fish species. Cormorants have a foraging distance of 35km (Thaxter *et al.*, 2012). While the development area supports limited areas of habitat that can be used by the species, given the foraging range for the species the number of individuals from SPAs occurring in the development area will be low; consequently there is no risk of significant effects to the SPAs. Potential significant *ex situ* effects to the SCI species of the SPAs from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
Wexford Harbour and Slobs SPA (004076)	44.6	
Ireland's Eye SPA (004117)	66.4	
Lambay Island SPA (004069)	75.9	
Keeragh Islands SPA (004118)	77.5	
Saltee Islands SPA (004002)	78.2	
Skerries Islands SPA (004122)	85.4	
Mid-Waterford Coast SPA (004193)	100.7	
Helvick Head to Ballyquin SPA (004192)	125.1	
Lough Derg (Shannon) SPA (004058)	137.9	
River Shannon and River Fergus Estuaries SPA (004077)	168.5	
Cork Harbour SPA (004030)	169.9	
Lough Cutra SPA (004056)	177.9	
Inner Galway Bay SPA (004031)	188.5	
Sovereign Islands SPA (004124)	200.6	
Connemara Bog Complex SPA (004181)	218.8	
Mid-Clare Coast SPA (004182)	221.1	
Ardboline Island and Horse Island SPA (004135)	239.4	
Castlemaine Harbour SPA (004029)	255.1	
West Donegal Coast SPA (004150)	257.4	
Horn Head to Fanad Head SPA (004194)	280.6	
Inishglora and Inishkeeragh SPA (004084)	306.1	

Red-throated Diver (*Gavia stellata*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
The Murrough SPA (004186)	21.3	Species breeds on freshwater pools or lakes in open moorland, blanket bogs or open and wet peatland habitats. It will nest on pools as small as 10-20 m long or on lakes up to 5 ha in area, showing a preference for those in treeless areas that have well-vegetated margins and low islets or promontories on which to nest. It generally avoids waters with dense floating or emergent vegetation and steep rocks above the water. Outside of the breeding season, the species frequents inshore waters along sheltered coasts, occasionally occurring inland on lakes, pools, reservoirs and rivers. Its diet consists predominantly of fish as well as crustaceans, molluscs, frogs, fish spawn, aquatic insects, annelid worms and plant matter. Red-throated diver have a foraging distance of 9km (Thaxter *et al*., 2012). All SPAs designated for the species are located over 20km from the development area. Given the distance of the SPA from the development area, and the very limited foraging range, it is highly unlikely that individuals from SPAs will occur in the development area; consequently there is no risk of significant effects to the SCI populations of the SPAs. Potential significant *ex situ* effects to the SCI species of the SPAs from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
The Raven SPA (004019)	42.5	
Castlemaine Harbour SPA (004029)	255.1	
Lough Foyle SPA (004087)	262.2	
Derryveagh and Glendowan Mountains SPA (004039)	263.7	
Blacksod Bay/Broad Haven SPA (004037)	282.5	

Table 2.16: Water column diver (shallow)

Goldeneye (*Bucephala clangula*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Wexford Harbour and Slobs SPA (004076)	44.6	Suitable habitats include freshwater lakes, pools, rivers and deep marshes surrounded by coniferous forest Nests in hollows of mature trees. The species will preferentially nest in trees in open stands near water or solitary trees on the edges of marshes, rather than in trees in dense stands in order to increase the ease of entry by flying. The diet of the species consists predominantly of aquatic invertebrates such as molluscs, worms, crustaceans, aquatic insects and insect larvae (*e.g.* dragonflies, damsel flies and may flies), as well as amphibians, small fish and some plant material (mainly in the autumn) such as seeds, roots and the vegetative parts of aquatic plants. While the development area supports areas of habitat that can be used by the species, the species does not undergo extensive foraging journeys and will remain largely faithful to the SPA sites. Given the significant distances of the SPAs from the development (minimum distance of 44.6km), its is unlikely that individuals from the SPAs will occur in the development area; consequently there is no risk of significant effects to the SPAs. Potential significant *ex situ* effects to the SCI species of the SPAs from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
Malahide Estuary SPA (004025)	71.2	
Lough Sheelin SPA (004065)	134.4	
Lough Derg (Shannon) SPA (004058)	137.9	
Lough Ree SPA (004064)	140.1	
Lough Swilly SPA (004075)	258.6	

Kingfisher (*Alcedo atthis*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
River Nore SPA (004233)	70.3	Suitable habitats for the species include freshwater lakes, pools, rivers and deep marshes surrounded by coniferous forest Found by still or slow flowing water such as lakes, canals and rivers. Typically observed on branches beside streams or river. Lays egg in nest at the end of riverbank burrows. Main prey is fish but will also consume aquatic insects, flies (Diptera), butterflies and moths (Lepidoptera), amphibians (Rana), crayfish (*Astacus*), prawns (*Palaemon*),amphipods (*Gammarus*) and isopods in winter. Very occasionally it feeds on berries (*Rubus, Sambucus*) and stems of reed (*Phragmites*). The species does not undergo extensive foraging journeys and will remain largely faithful to the SPA sites. Given the significant distances of the SPAs from the development (over 70km), individuals from the SPAs will not occur in the development area; consequently there is no risk of significant effects to the SCI populations of the SPAs. Potential significant *ex situ* effects to the SCI species of the SPAs from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
River Boyne and River Blackwater SPA (004232)	90.6	

Table 2.17: Intertidal walker (in and out of water)

Curlew (*Numenius arquata*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Wexford Harbour and Slobs SPA (004076)	**44.6**	The species frequents muddy coasts, bays and estuaries with tidal mudflats and sandflats, rocky and sandy beaches with many pools, saltmarshes coastal meadows and pasture and muddy shores of coastal lagoons. It also utilises wet grassland and arable fields during migration. Its diet consists chiefly of annelid worms and terrestrial insects especially during the summer although it will also take crustaceans, molluscs, polychaete worms. While the species has been noted to feed at suitable foraging sites adjacent to SPA sites particular during periods of high water and loss of access to intertidal habitats, the species does not exhibit extensive foraging journeys. While this behaviour indicates that there is very low potential for species from the SPAs to occur in the development area, the closest SPA to the development is brought forward to **Section 3 Stage 2 AA NIS** for a more detailed consideration of the potential for effects. The SPA designated for Curlew brought forward is highlighted in **bold** in column 1 opposite.
North Bull Island SPA (004006)	60.5	
Bannow Bay SPA (004033)	72.4	
Tramore Back Strand SPA (004027)	93.9	
Dundalk Bay SPA (004026)	118.2	
Dungarvan Harbour SPA (004032)	124.3	
Blackwater Estuary SPA (004028)	145.1	
Ballymacoda Bay SPA (004023)	152.6	
Ballycotton Bay SPA (004022)	163.8	
River Shannon and River Fergus Estuaries SPA (004077)	168.5	
Cork Harbour SPA (004030)	169.9	
Inner Galway Bay SPA (004031)	188.5	
Courtmacsherry Bay SPA (004219)	213.8	
Clonakilty Bay SPA (004081)	227.2	
Killala Bay/Moy Estuary SPA (004036)	247.7	
Tralee Bay Complex SPA (004188)	249.6	
Lough Swilly SPA (004075)	258.6	
Lough Foyle SPA (004087)	262.2	
Blacksod Bay/Broad Haven SPA (004037)	282.5	

Oystercatcher (*Haematopus ostralegus*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Wexford Harbour and Slobs SPA (004076)	**44.6**	Forages on intertidal soft substrates on bivalves and gastropods. Polychaetes and crustaceans are more important in estuaries however, and molluscs are most important on rocky shores. When inland, prey such as earthworms and insect larvae (*e.g.* caterpillars and cranefly larvae) are also taken. Like Curlew (*Numenius arquata*) the foraging behaviour of Oystercatcher indicates that there is low potential for species from the SPAs to occur in the development area. Adopting a precautionary approach, however, the closest SPA to the development is brought forward to **Section 3 Stage 2 AA NIS** for a more detailed consideration of the potential for effects. The SPA designated for Oystercatcher brought forward is highlighted in **bold** in column 1 opposite.
South Dublin Bay and River Tolka Estuary SPA (004024)	55.1	
North Bull Island SPA (004006)	60.5	
Malahide Estuary SPA (004025)	71.2	
Bannow Bay SPA (004033)	72.4	
Rogerstown Estuary SPA (004015)	76.6	
River Nanny Estuary and Shore SPA (004158)	94.6	
Boyne Estuary SPA (004080)	102.4	
Dundalk Bay SPA (004026)	118.2	
Dungarvan Harbour SPA (004032)	124.3	
Cork Harbour SPA (004030)	169.9	
Cummeen Strand SPA (004035)	225.3	
Tralee Bay Complex SPA (004188)	249.6	
Castlemaine Harbour SPA (004029)	255.1	
Lough Swilly SPA (004075)	258.6	
Lough Foyle SPA (004087)	262.2	

Golden Plover (*Pluvialis apricaria*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Cahore Marshes SPA (004143)	27.1	Diet consists of small crustaceans, molluscs, polychaete worms, isopods, amphipods, insects (*e.g.* ants, beetles, flies and fly larvae) and millipede. Found on muddy, sandy or pebbly coasts. The development area does support extensive suitable foraging areas for the species. Consequently, individuals from the SPAs will not occur in the development area; consequently there is no risk of significant effects to the SPA. Potential significant *ex situ* effects to the species from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
Wexford Harbour and Slobs SPA (004076)	44.6	
North Bull Island SPA (004006)	60.5	
Baldoyle Bay SPA (004016)	65.8	
Tacumshin Lake SPA (004092)	69.3	
Malahide Estuary SPA (004025)	71.2	
Bannow Bay SPA (004033)	72.4	
Ballyteige Burrow SPA (004020)	72.8	
Tramore Back Strand SPA (004027)	93.9	
River Nanny Estuary and Shore SPA (004158)	94.6	
Boyne Estuary SPA (004080)	102.4	
Dundalk Bay SPA (004026)	118.2	
Lough Iron SPA (004046)	123.3	
Dungarvan Harbour SPA (004032)	124.3	
River Little Brosna Callows SPA (004086)	127.7	
Middle Shannon Callows SPA (004096)	129.2	
River Suck Callows SPA (004097)	138.2	
Lough Ree SPA (004064)	140.1	
Blackwater Estuary SPA (004028)	145.1	
Ballymacoda Bay SPA (004023)	152.6	
Lough Croan Turlough SPA (004139)	154.8	
Four Roads Turlough SPA (004140)	159.6	
Ballycotton Bay SPA (004022)	163.8	
River Shannon and River Fergus Estuaries SPA (004077)	168.5	
Cork Harbour SPA (004030)	169.9	

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Rahasane Turlough SPA (004089)	180.6	
Inner Galway Bay SPA (004031)	188.5	
Lough Corrib SPA (004042)	201.6	
Courtmacsherry Bay SPA (004219)	213.8	
Connemara Bog Complex SPA (004181)	218.8	
Killala Bay/Moy Estuary SPA (004036)	247.7	
Tralee Bay Complex SPA (004188)	249.6	
Lough Nillan Bog SPA (004110)	255.1	
Owenduff/Nephin Complex SPA (004098)	260.5	
Lough Foyle SPA (004087)	262.2	
Derryveagh and Glendowan Mountains SPA (004039)	263.7	

Ringed Plover (*Charadrius hiaticula*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
South Dublin Bay and River Tolka Estuary SPA (004024)	55.1	Its diet consists of small crustaceans, molluscs, polychaete worms, isopods, amphipods, insects (*e.g.* ants, beetles, flies and fly larvae) and millipede and favours muddy, sandy or pebbly coasts including estuaries, tidal mudflats, sandflats and exposed reefs. The development area does not support extensive suitable foraging areas for the species. Consequently, individuals from the SPAs will not occur in the development area; consequently there is no risk of significant effects to the SPA. Potential significant *ex situ* effects to the species from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
Baldoyle Bay SPA (004016)	65.8	
Rogerstown Estuary SPA (004015)	76.6	
River Nanny Estuary and Shore SPA (004158)	94.6	
Dundalk Bay SPA (004026)	118.2	
Ballymacoda Bay SPA (004023)	152.6	
Ballycotton Bay SPA (004022)	163.8	
River Shannon and River Fergus Estuaries SPA (004077)	168.5	
Inner Galway Bay SPA (004031)	188.5	
Mid-Clare Coast SPA (004182)	221.1	
Killala Bay/Moy Estuary SPA (004036)	247.7	
Tralee Bay Complex SPA (004188)	249.6	
Castlemaine Harbour SPA (004029)	255.1	
Blacksod Bay/Broad Haven SPA (004037)	282.5	
Inishkea Islands SPA (004004)	304.7	

Lapwing (*Vanellus vanellus*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Cahore Marshes SPA (004143)	**27.1**	Its diet consists of adult and larval insects (e.g. beetles, ants, Diptera, crickets, grasshoppers, dragonflies, mayflies, cicadas and Lepidoptera), spiders, snails, earthworms, frogs, small fish and seeds or other plant material. The species shows a preference for breeding on wet natural grasslands meadows and hay meadows with short swards and patches of bare soil at low altitudes. While the species does not undergo extensive foraging journeys and will remain largely faithful to the SPA sites, adopting a precautionary approach, the SPA located closest to the development is brought forward to **Section 3 Stage 2 AA NIS** for a more detailed consideration of the potential for effects. The SPA designated for Lapwing brought forward is highlighted in **bold** in column 1 opposite.
Wexford Harbour and Slobs SPA (004076)	44.6	
Tacumshin Lake SPA (004092)	69.3	
Bannow Bay SPA (004033)	72.4	
Ballyteige Burrow SPA (004020)	72.8	
Tramore Back Strand SPA (004027)	93.9	
Boyne Estuary SPA (004080)	102.4	
Dundalk Bay SPA (004026)	118.2	
Dungarvan Harbour SPA (004032)	124.3	
River Little Brosna Callows SPA (004086)	127.7	
Middle Shannon Callows SPA (004096)	129.2	
River Suck Callows SPA (004097)	138.2	
Lough Ree SPA (004064)	140.1	
Blackwater Estuary SPA (004028)	145.1	
Ballymacoda Bay SPA (004023)	152.6	
Ballycotton Bay SPA (004022)	163.8	
River Shannon and River Fergus Estuaries SPA (004077)	168.5	
Cork Harbour SPA (004030)	169.9	
Inner Galway Bay SPA (004031)	188.5	
Courtmacsherry Bay SPA (004219)	213.8	
Tralee Bay Complex SPA (004188)	249.6	
Lough Foyle SPA (004087)	262.2	
Termoncarragh Lake and Annagh Machair SPA (004093)	303.8	

Grey Heron (*Ardea cinerea*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Wexford Harbour and Slobs SPA (004076)	44.6	Generalist in its habitat use, although shallow water and relatively large prey are among the essential characteristics of its habitat. Mainly feeds on fish and eels 10-25 cm long, as well as amphibians, crabs, molluscs, crustaceans, aquatic insects, snakes, small rodents, small birds and plant matter. While the species has been noted travel to suitable foraging sites, the species typically does not exhibit extensive foraging journeys when suitable habitats and prey are available locally; given this behaviour very few, if any, individuals from the SPAs will occur in the development area. Consequently, there is no risk of significant effects to the SPA. Potential significant *ex situ* effects to the species from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
Cork Harbour SPA (004030)	169.9	
Inner Galway Bay SPA (004031)	188.5	
Lough Swilly SPA (004075)	258.6	

Turnstone (*Arenaria interpres*)

Site name (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
North Bull Island SPA (004006)	60.5	Its diet consists of insects, crustaceans, molluscs (especially mussels or cockles), annelids, echinoderms, small fish, carrion and birds' eggs. The species favours intertidal stony habitats over sandflats and mudflats. The development area does not support suitable foraging areas for the species. Consequently, individuals from the SPAs will not occur in the development area; consequently there is no risk of significant effects to the SPA. Potential significant *ex situ* effects to the species from impact mechanisms 1, 2 and 4 excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
Skerries Islands SPA (004122)	85.4	
Boyne Estuary SPA (004080)	102.4	
Dungarvan Harbour SPA (004032)	124.3	
Ballymacoda Bay SPA (004023)	152.6	
Ballycotton Bay SPA (004022)	163.8	
Inner Galway Bay SPA (004031)	188.5	
Mid-Clare Coast SPA (004182)	221.1	
Tralee Bay Complex SPA (004188)	249.6	
Castlemaine Harbour SPA (004029)	255.1	
Inishkea Islands SPA (004004)	304.7	

Table 2.18: Surface swimmer – dabbling ducks

Mallard (*Anas platyrhynchos*)

SPA (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Wexford Harbour and Slobs SPA (004076)	44.6	The species occurs in almost every wetland type although it generally avoids fast-flowing, oligotrophic deep, exposed, rough, rockbound waters and hard unvegetated areas such as rocky ground, sand dunes and artificial surfacing. It requires water less than 1 m deep for foraging and shows a preference for freshwater habitats although it may frequent shallow brackish waters as long as they provide the cover of submerged, floating, emergent or riparian vegetation, dense reedbeds or overhanging branches. Its diet consists of seeds and the vegetative parts of aquatic and terrestrial plants (e.g. crops) as well as terrestrial and aquatic invertebrates (especially in the spring and summer) such as insects, molluscs, crustaceans, worms and occasionally amphibians and fish. The species does not exhibit travel extensive to suitable foraging sites, in particular in circumstances where suitable habitats are available locally. Consequently, it is unlikely that significant number of individuals from SPAs will occur in the development area and potential significant *ex situ* effects to the species from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
Dundalk Bay SPA (004026)	118.2	
Lough Ree SPA (004064)	140.1	
Ballyallia Lough SPA (004041)	190.2	
The Gearagh SPA (004109)	217.6	
Tralee Bay Complex SPA (004188)	249.6	
Castlemaine Harbour SPA (004029)	255.1	
Lough Swilly SPA (004075)	258.6	
Lough Foyle SPA (004087)	262.2	

Teal (*Anas crecca*)

SPA (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
The Murrough SPA (004186)	21.3	They usually nest near small freshwater lakes or pools and small upland streams away from the coast, and also in thick cover. During winter species is widespread on wetlands with good cover, such as reedbeds. Wide variety of habitats, both coastal and inland, and usually below an altitude of 200 metres, including coastal lagoons and estuaries and inland marshes, lakes, ponds and turloughs Small seeds predominate, but Enteromorpha sp. and molluscs are also frequently taken. Occasionally feed on chironomid larvae where available, though usually during the summer months. They feed by day where they are safe from shooting. As is the case for Mallard above, Teal does not undergo extensive foraging journeys, in particular, if suitable foraging habitat is available locally. Given this behaviour, potential significant *ex situ* effects to the species from the SPAs from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA (the SCI and SPAs are excluded from further assessment).
Wexford Harbour and Slobs SPA (004076)	44.6	
North Bull Island SPA (004006)	60.5	
Tacumshin Lake SPA (004092)	69.3	
Dundalk Bay SPA (004026)	118.2	
Lough Iron SPA (004046)	123.3	
River Little Brosna Callows SPA (004086)	127.7	
Lough Ree SPA (004064)	140.1	
Blackwater Callows SPA (004094)	141.8	
Ballymacoda Bay SPA (004023)	152.6	
Ballycotton Bay SPA (004022)	163.8	
River Shannon and River Fergus Estuaries SPA (004077)	168.5	
Cork Harbour SPA (004030)	169.9	
Kilcolman Bog SPA (004095)	177.7	
Inner Galway Bay SPA (004031)	188.5	
Ballyallia Lough SPA (004041)	190.2	
Corofin Wetlands SPA (004220)	192.6	
The Gearagh SPA (004109)	217.6	
Tralee Bay Complex SPA (004188)	249.6	
Lough Swilly SPA (004075)	258.6	
Lough Foyle SPA (004087)	262.2	
The Murrough SPA (004186)	21.3	
Wexford Harbour and Slobs SPA (004076)	44.6	

Pochard (*Aythya ferina*) and Tufted Duck (*Aythya fuligula*)

SPA (Site code)	Distance to development (km)	Source-Pathway-Receptor Assessment
Lough Ennell SPA (004044)	110.1km	The diet of Pochard consists of seeds, roots, rhizomes, the vegetative parts of grasses, sedges and aquatic plants as well as aquatic insects and larvae, molluscs, crustaceans, worms, amphibians and small fish. This species requires well-vegetated eutrophic to neutral swamps, marshes, lakes and slow-flowing rivers with areas of open water and abundant emergent fringing vegetation. Tufted Duck are omnivorous feeding mainly on molluscs, gastropods, crustaceans and aquatic insects, as well as seeds and vegetative parts of aquatic plants. It is common on large, freshwater lakes, ponds, reservoirs, gravel-pits and quiet stretches of wide slow-flowing rivers during this season Pochard and Tufted Duck do not undergo extensive foraging journeys. The closest SPA designated for the species to the development is located 118.2 km north west. Given the distance of SPAs from the development area, potential significant *ex situ* effects to the species from impact mechanisms 1, 2 and 4 can be excluded at the Screening for AA stage (the SCI and SPAs are excluded from further assessment).
Lough Derravarragh SPA (004043)	118.2km	
Lough Sheelin SPA (004065)	134.4km	
Lough Kinale and Derragh Lough SPA (004061)	135.5km	
Lough Corrib SPA (004042)	201.6km	
Lough Fern SPA (004060)	269.2km	

Table 2.19: SCI species and their SPA sites screened in for consideration in Section 3 Stage 2 AA

Species	Site (Site code) (Distance to development)
Lesser Black-backed Gull (*Larus fuscus*)	Poulaphouca Reservoir SPA (004063) (41.2km north west of the proposed development)
	Wexford Harbour and Slobs SPA (004076) (44.6km south)
	Lambay Island SPA (004069) (75.9km north)
	Saltee Islands SPA (004002) (78.2km north)
	Ballymacoda Bay SPA (004023) (152.6km south west)
	Ballycotton Bay SPA (004022) (163.8km south west)
	Cork Harbour SPA (004030) (169.9km south west)
Herring Gull (*Larus argentatus*)	Ireland's Eye SPA (004117) (66.4km north)
	Saltee Islands SPA (004002) (78.2km north)
	Skerries Islands SPA (004122) (85.4km)
Black-headed Gull (*Chroicocephalus ridibundus*)	The Murrough SPA (004186) (21.3km north)
Wigeon (*Anas penelope*)	The Murrough SPA (004186) (21.3km north)
	Cahore Marshes SPA (004143) (27.1km south)
	Wexford Harbour and Slobs SPA (004076) (44.6km south)
	Tacumshin Lake SPA (004092) (69.3km south)
Curlew (*Numenius arquata*)	Wexford Harbour and Slobs SPA (004076) (44.6km south)
Oystercatcher (*Haematopus ostralegus*)	Wexford Harbour and Slobs SPA (004076) (44.6km south)
Lapwing (*Vanellus vanellus*)	Cahore Marshes SPA (004143) (27.1km south)

2.4.3.5. QIs of Distant SAC

The Wicklow Mountains SAC (Site code: 002122) is designated for the Otter (*Lutra lutra*). The SAC is hydrologically connected to the proposed development area. Likely significant ex-situ effects to QI of the SACs can be excluded at the Screening for AA stage. The screening exercise of the potential effect of the proposed development to the QI species is presented in **Table 2.20** below.

Table 2.20: Qualifying Interests of SACs hydrologically connected to the proposed development. Potential significant effects to QIs are highlighted in bold.

Wicklow Mountains SAC (Site code: 002122)[40]					
Qualifying Interest		**Conservation Objective**	**Impact Mechanism**	**Description of Potential Effects**	**Source-Pathway-Receptor Assessment**
Annex II aquatic mammal species	*Lutra lutra* (Otter) [1355]*	To Maintain the favourable conservation condition	1. Discharges	No potential significant ex-situ effects.	Otter *Lutra lutra* is listed as a Qualifying Interest for Wicklow Mountains SAC (Site Code 002122). The SAC is hydrologically connected to the proposed development area via the Avonmore, Avonbeg and Avoca rivers. NBDC database includes a sighting of the otter in the Avoca River at Arklow Bridge. Otters will utilise freshwater habitats from estuary to headwaters. No aquatic habitat severance will arise to Otters moving between the upper Avoca River catchment and coastal waters, since water will continue to flow through the river and estuary during construction works for the Arklow FRS development. There is potential that otter may migrate from the SAC into the project area. NBDC database includes a sighting of otter in the Avoca River at Arklow Bridge. Otter are visual hunters with good eyesight both above and below the water. The release sediments in the water column during excavation and construction and the resuspension of sediments during dredging has the potential to significantly affect turbidity levels. Otter is a highly mobile species and while their eyes are adapted for seeing food item in murky or dark water, they will avoid areas of excessive turbidity. While significant increases in turbidity may result in the temporary displacement of the species, there are extensive alterative areas of otter habitat available to the species away from the project area. Consequently, there is no risk of significant effects (the QI and impact mechanism combination is excluded from further assessment).
Annex II aquatic mammal species	*Lutra lutra* (Otter) [1355]*	To Maintain the favourable conservation condition	2. Loss of in-river habitat	No viable pathway for significant effects.	While the proposed Arklow FRS development will result in loss of some in-river habitat, the loss is small relative to the area available to otter; consequently, it can be concluded that there will be no potential significant effect to the QIs. The QIs and impact mechanism combinations are screened out of further assessment.
Annex II aquatic	*Lutra lutra*	To Maintain the favourable	3. Noise disturbance	No viable pathway for	Otters are quite tolerant of human disturbance and are often recorded in urban areas. Otter are mainly active in the early morning and/ or late evening. Given this behaviour, it is unlikely that the species will be active in the project area during operations and encounter rates will be low;

[40] NPWS 2017 Conservation Objectives Wicklow Mountains SAC 002122 https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO002122.pdf

mammal species	(Otter) [1355]*	conservation condition		significant effects.	consequently, significant disturbance effects will not occur. It is possible that while ongoing, construction activity will deter otter from foraging in the immediate project area. It should be noted however that given general daylight timing of construction activities, any disturbance resulting in displacement of the species will be temporary and short lived, and will not result in significant effects. In addition, there are extensive alterative areas of otter habitat available to the species away from the project area. The risk of a significant effect to otter can be excluded; the QI and impact mechanism combination is screened out of further assessment.
Annex II aquatic mammal species	*Lutra lutra* (Otter) [1355]*	To restore the favourable conservation condition	4. Loss of marsh habitat	No viable pathway for significant effects.	Surveys at the marsh areas did not report otter holts or evidence of otter activity. No potential pathway for interaction exists between the impact mechanisms and the QI, significant effects are excluded (*i.e.* no connectivity exists). The risk of a significant effect to otter can be excluded; the QI and impact mechanism combination is screened out of further assessment.
Annex II aquatic mammal species	*Lutra lutra* (Otter) [1355]*	To restore the favourable conservation condition	5. Barrier to faunal movement	No viable pathway for significant effects.	The debris trap located approximately 300m upstream of Arklow Bridge will extend 45 – 50 m across the river from the north to the south banks of the river. It will be constructed of RC columns founded at a suitable formation level and rising to 500mm above design flood level. The columns are roughly 2.5m or more apart and will not obstruct otter movements. The gravel trap located approximately 10m upstream of the debris trap extends across the width of the river. The gravel trap comprises a trough and will not obstruct otter movements. The risk of a significant effect to otter can be excluded; the QI and impact mechanism combination is screened out of further assessment.

2.4.4. Plans or Projects That Might Act In-Combination

As outlined in **Section 2.1**, the obligation to undertake AA under the Part XAB of the Planning and Development Act 2000 and the 2011 Birds and Natural Habitats Regulations derives from Article 6(3) and 6(4) of the Habitats Directive. Regulation 42 (1) of the 2011 Regulations requires that the Screening *for AA considers whether a project in combination with other plans or projects is likely to have a significant effect on the European site*.

It is therefore required that the potential impacts of the proposed project be considered in combination with other relevant plans or projects.

The assessment of potential in combination effects considers the potential impact mechanisms associated with the proposed development that in combination with other plans and project may result in significant effects to QIs and SCIs.

To inform the assessment of potential in combination effects a review was undertaken of consent applications for projects in the vicinity of the proposed project included on the following web-sites:

- Department of Housing, Local Government and Heritage (DHLGH) – Foreshore Applications
    - https://www.housing.gov.ie/planning/foreshore/applications/
- DHPLG - EIA Portal
    - https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal
- Wicklow Council - Planning System
    - https://www.wicklow.ie/Living/Services/Planning/Planning-Applications

The assessment of potential in combination effects also considered *negative impacting threats and pressures* and *positive impacting activities/ management* affecting the sites as identified in Natura 2000 Standard Data Forms published for the SPA and SAC sites available through the NPWS website (https://www.npws.ie/protected-sites).

- Circle K Safeway Service Station (20426) - This project relates to the demolition of the existing, and construction of a new, fuel forecourt at the existing Circle K service station, which is located adjacent to Arklow Town Marsh and SC1 of the proposed development. Both the Circle K project and Arklow FRS development carry the risk for the uncontrolled release of discharges including sediment laden water, and runoff chemicals or other waste material pollution. There is potential that these discharges may act in combination to effect the availability of food items for foraging birds. A detailed consideration of the potential for in combination effects is required (see **Section 3.7**).

- Irish Water - Arklow Wastewater Treatment Plan (FS006862) - The proposed Arklow Wastewater Treatment Plant Project comprises the construction of a new WwTP, associated infrastructure including sewer network and marine outfall as well as an upgrade to the existing coastal revetment. The proposed WwTP project planning boundary is concentrated around the waterfront area of Arklow, with the proposed interceptor sewers located along the northern and southern banks of the Avoca River channel and the WwTP located at the Old Wallboard site at Ferrybank. Given the relative location of the WwTP project and FRS development planning boundary areas there is potential for in-combination effects. Further detailed consideration of the potential for adverse in combination effects is required (see **Section 3.7**).

Potential in-combination effects from the following projects were excluded based on the distance from the Arklow FRS development:

- Action Health Enterprises GP Limited the Former Boland's Builders Providers, Castle Park (181170) - This project relates to the development of a primary care facility at Castle Park.
- Frank & Sandra Duffy No 7 and 8 Bridge Street &, No 34 Main Street (19750) - The project relates to the demolition of 2 existing buildings and the construction of a new retail and commercial building on Main Street.
- Gaines Europe Ltd Unit 1A Lower Tinahisk, South Quay (16248) - This project relates to the development of a new warehouse and distribution facility at Arklow Harbour.
- Gaines Europe Ltd Tinahisk Lower, South Quay (16414) - This project relates to the demolition of an existing industrial building at Arklow Harbour.
- Joby Developments North Quay, Arklow (15857) – This project relates to the demolition of existing structures and the construction of 2 no. 5 storey blocks.
- Mill Sea Ltd North Quay, Arklow (18316) – This project relates to the demolition of existing disused industrial buildings.
- Crag Digital Avoca Limited (18940/201285) – This project relates to the construction of a data storage facility comprising 3 data storage buildings in the Avoca River Business Park.
- Parade Ground (186) – This project relates to the transformation of the streetscape and public realm.
- Arklow Bank Wind Park Phase 2 Onshore Grid Infrastructure (Pre-application 306662) – This project relates to the onshore grid infrastructure to the Arklow Bank Phase 2 wind park.
- 20469 (Wicklow County Council Inner Harbour / Dock, Off South Quay) - Construction of 14 Storage units and associated site works.

It was concluded that **there is potential likelihood for significant effects from the proposed project in combination with the following plans or projects; Circle K Safeway Service Station (20426) and the Arklow Wastewater Treatment Plan (FS006862). Potential in-combination effects are assessed further in Section 3.7.**

2.5. Screening Exercise Outcome

The screening exercise investigates the potential for the proposed development to have significant *in situ* and/ or *ex situ* effects on European sites within the Natura 2000 network.

The screening exercise has determined, in light of best available scientific data, that there is potential for significant *ex-situ* effects of the Arklow FRS development on SCI species. The SCI species and their SPA sites that are screened in for further detailed consideration of the potential for effects are summarised in **Table 2.19**. The likelihood of significant *in situ* and *ex situ* effects on all other QIs and SCIs of European sites has been excluded (screened out).

The findings of the screening exercise are summarised in **Table 2.21**.

Table 2.21: Screening matrix of the proposed project.

Screening Matrix	
Brief description of the project or plan	The proposed development will involve the construction of flood defences and an embankment, as well as conveyance improvements in the Avoca River; including deepening of the river channel, the introduction of new debris and gravel traps and strengthening works to the existing quay walls and Arklow Bridge. The Avoca River is tidal in the Arklow area and some of the proposed development will be located in the foreshore. Future maintenance of the Arklow Flood Relief Scheme will also be carried out. A detailed description of the proposed development is presented in **Section 2.2.**
European Site(s)	
Brief description of the relevant European site(s)	The European sites within 15km of the proposed development site are: • Buckroney – Brittas Dunes and Fen SAC (Site Code 000729) (4.9km north of the proposed development) • Kilpatrick Sandhills SAC (Site Code 001742) (6.8km south) • Slaney River Valley SAC (Site Code 000781) (13.3km west) • Magharabeg Dunes SAC (Site Code 001766) (14.8km north) A total of 24 protected mobile SCI species designated for SPAs were identified as occurring in the Arklow FRS development area and Arklow Town Marsh pNHA. The SPAs designated for the SCI species are listed in **Section 2.4.3.4** (see **Table 2.9** through **Table 2.18**).

Assessment Criteria and European Site(s)	
Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European site.	Given the nature of the proposed activities and the biological receptors, the potential project impact mechanisms (or sources of potential impact to the environment) are: **1. Discharges** - activities associated with construction may result in the release of sediment, chemical (*e.g.* hydrocarbons) or other waste material pollution. **2. Loss of in river habitat** due to construction of river access points, temporary causeways *etc*. **3. Noise disturbance** associated with the construction activity (including the installation of river access points, earth embankments, demolition works, pilling operations and dredging). **4. Loss of habitat at Arklow Town pNHA** due to construction and installation of flood defence walls and embankment. **5.** Barrier to faunal movement due to installation of gravel and embankments.

Brief description of the European site(s)
 	
Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site by virtue of
 	
Size and scale, Land-take.
 	
Distance from the Natura 2000 site or key interests of the site;
	The European sites within 15km of the proposed development site are shown in **Figure 2-24**. The sites are:
	• Buckroney – Brittas Dunes and Fen SAC (Site Code 000729) (4.9km north of the proposed development)
	• Kilpatrick Sandhills SAC (Site Code 001742) (6.8km south)
	• Slaney River Valley SAC (Site Code 000781) (13.3km west)
	• Magharabeg Dunes SAC (Site Code 001766) (14.8km north)
	Site synopsis reports the SAC sites are presented in **Appendix 3.** Following source-pathway-receptor assessment, potential significant effects of impact mechanism **1**, **2**, **3**, **4** and **5** to the QIs of the SACs were excluded at the screening stage.
	
	A total of 24 SCI bird species designated for SPAs have been recorded in the Arklow FRS development area and the adjacent Arklow Town Marsh pNHA. Of the 24 species potential significant *ex situ* effects were determined to exist for the following 7 SCI bird species and associated SPA sites:
	• The Murrough SPA (004186) (21.3km north of the proposed development)
	  ○ Black-headed Gull (*Chroicocephalus ridibundus*)
	  ○ Wigeon (*Anas penelope*)
	• Cahore Marshes SPA (004143) (27.1km south)
	  ○ Lapwing (*Vanellus vanellus*)
	  ○ Wigeon (*Anas penelope*)
	• Poulaphouca Reservoir SPA (004063) (41.2km north west)
	  ○ Lesser Black-backed Gull (*Larus fuscus*)
	• Wexford Harbour and Slobs SPA (004076) (44.6km south)
	  ○ Curlew (*Numenius arquata*)
	  ○ Lesser Black-backed Gull (*Larus fuscus*)
	  ○ Oystercatcher (*Haematopus ostralegus*)
	  ○ Wigeon (*Anas penelope*)
	• Ireland's Eye SPA (004117) (66.4km north)
	  ○ Herring Gull (*Larus argentatus*)
	• Tacumshin Lake SPA (004092) (69.3km south)
	  ○ Wigeon (*Anas penelope*)
	• Lambay Island SPA (004069) (75.9km north)
	  ○ Lesser Black-backed Gull (*Larus fuscus*)
	• Saltee Islands SPA (004002) (78.2km south)
	  ○ Herring Gull (*Larus argentatus*)
	  ○ Lesser Black-backed Gull (*Larus fuscus*)
	• Skerries Islands SPA (004122) (85.4km north)
	  ○ Herring Gull (*Larus argentatus*)
	• Ballymacoda Bay SPA (004023) (152.6km south west)
	  ○ Lesser Black-backed Gull (*Larus fuscus*)
	• Ballycotton Bay SPA (004022) (163.8km south west)

	○ Lesser Black-backed Gull (*Larus fuscus*) • Cork Harbour SPA (004030) (169.9km south west) ○ Lesser Black-backed Gull (*Larus fuscus*) The project impact mechanisms of concern with respect to potential *ex situ* effects to the SCI bird species are: 1. Discharges, 2. Loss of in-river habitat and 4. Loss of habitat at Arklow Town Marsh pNHA. Site synopsis report for the above listed SPAs are included in Appendix 3. Potential effect of impact mechanism 3. Noise disturbance and 5. Barrier to faunal movement were excluded at the screening stage.
Resource requirements (water abstraction *etc.*):	During the proposed project, construction equipment and plant (excavators, long reach tracked excavators, standard excavators and dump trucks etc.) will be in operation. The fuel used by the construction equipment, dumper trucks and plant and vessels will be petrol/ diesel. Materials required are detailed in **Section 2.2.** The main material required includes concrete, sheet-piled walling, concrete slabs, rock armour (riprap), debris and gravel trap, material for earth embankment *etc.*
Emissions (disposal to land, water or air);	Atmospheric and noise emissions from construction equipment, dumper trucks, plant *etc.* Potential release of sediment, chemicals or other waste material pollution from construction and dredging activities. Noise emissions associated with the construction works.
Excavation requirements; Transportation requirements;	Construction and dredging activities will generate material requiring transportation. Material not used will be taken from site using dumper trucks for disposal at licenced facilities. Material to be used will be delivered using trucks.
Duration of construction, operation, Other.	Subject to obtaining planning approval, construction of the proposed scheme is expected to commence in Quarter (Q) 1 of 2022. The construction duration of the proposed development is estimated at 54 months based on the reasonable worst case assessed in the EIAR. However, work will not be continuous over this period as the in-channel works are restricted to the summer months (approximately from May to September inclusive). Wicklow County Council considers Arklow FRS to be a key strategic asset in the protection of Arklow Town from flooding and it will have a minimum of a 50 year design life during which time on-going maintenance will be required. The maintenance phase of the proposed development will involve bridge pier, debris and silt trap, and flood wall maintenance. Maintenance of the debris and gravel traps which will typically be carried out at times of low river flow and ideally during the summer months (May-September) will involve removal of debris using a mechanical grab and a dump truck. Removal of branches and vegetation impacting on flood flows in the river will be carried out to improve the conveyance capacity of the river channel. This will be carried out annually, typically in Autumn prior to the winter flood season and over the stretch of river upstream of Arklow Bridge as far as the gravel and debris traps Maintenance dredging will be required to sediment settled within the river channel. It is estimated that maintenance dredging will be required every ten years.
Describe any likely changes to the site arising as a result of:	• **Reduction in habitat area and Habitat or species fragmentation** *Loss of in-river habitat* Aspects of the proposed development that will result in loss of in-river habitat include the construction of river access points, temporary causeways, and the installation of the debris and gravel trap and riprap within the river channel, in-

Reduction in habitat area; Disturbance to key species; Habitat or species fragmentation; Reduction in species density; Changes in key indicators of conservation value (water quality *etc*.); Climate change	stream dredging including the removal of the in-stream gravel bank and islands located upstream of the Arklow bridge. *Loss of habitat at Arklow Town pNHA* The construction of flood walls and embankment will result in the loss of marsh habitat. • **Disturbance to key species and Reduction in species density** *Discharges* There is also a risk that sediment laden water and runoff from stockpiles of excavated dredge material, in particular during dewatering, may result in the introduction of sediment and, hazardous and non-hazardous contaminants to marsh habitats of the pNHA and nearby watercourses, impacting habitat quality and bird foraging opportunities. • **Climate Change** Chapter 19 of the Arklow FRS EIAR assesses the likely significant effects of the proposed development on climate, including a quantitative carbon impact assessment. The following aspects are particularly relevant to the climate assessment: • Construction, design and operation: • The climate impact associated with the use of raw materials for construction, operation and maintenance of the proposed development The impact assessment identified no significant adverse effects during the construction or operation of the proposed development, no mitigation measures are required.
Describe any likely impacts on the Natura 2000 site as a whole in terms of: Interference with the key relationships that define the structure of the site; Interference with key relationships that define the function of the site.	Behavioural changes and/ or injury to SCIs and loss of habitats could have knock on effects to the wider ecological functioning of the area in particular predator/ prey relationships and foraging opportunities.
Provide indicators of significance as a result of the identification of effects set out above in terms of: Loss; Fragmentation; Disruption; Disturbance; Change to key elements of the site.	Indicators of loss are: • decreases in species abundance and diversity within the proposed development area and adjacent habitats. • decreases in distribution/ extent of habitats (*e.g.* loss of in-river habitat). Indicators of fragmentation • removal of habitat area (*e.g.* embankment across marsh areas) Indicators of disturbance • changing species abundance and diversity within the proposed development area.
Describe from the above those elements of the project or plan, or combination of elements, where the	The screening exercise has determined, in light of best available scientific data, that there is potential for significant effects of the Arklow FRS development to 7 SCI bird species that have been reported within the proposed development area and adjacent Arklow Town Marsh pNHA. The potential impact mechanisms of concern with respect to bird species are: 1 Discharges, 2 Loss of in-river habitats and 4 Loss of habitat at Arklow pNHA. As the significance of the effects to the SCI species is

above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	unknown, it is concluded here that further detailed consideration of the potential for adverse effects is required (see **Section 3 NIS**). There is potential for significant effects from the proposed project in combination with the following plans or projects; Circle K Safeway Service Station (20426), Irish Water - Arklow Wastewater Treatment Plan (FS006862). As the significance of the effects to the is unknown, it is concluded here that further detailed consideration of potential in-combination effects is required (see **Section 3.7**).

3. Stage 2 Appropriate Assessment - Natura Impact Statement

3.1. Overview

This Natura Impact Statement (NIS) has been produced to inform the AA of the proposed development to be undertaken by the competent authority (An Bord Pleanála).

The screening exercise presented in **Section 2** has determined that the proposed development has the potential to result in significant *ex situ* effects on 7 SCI species and associated SPAs.

The NIS considers in greater detail the aspects of the proposed project with potential for significant effects to the SCI species and associated SPAs.

The NIS also further examines the impacts of the proposed project on the integrity of European sites with respect to Conservation Objectives set for the conservation features of the sites. Where potential significant adverse effects are identified, mitigation measures are identified to prevent adverse effects on the integrity of the SPAs.

3.2. Description of the Proposed Development

The objective of the proposed development is to provide flood relief to Arklow town by improving the conveyance capacity of the river channel. The proposed development will involve the construction of flood defences and an embankment, as well as conveyance improvements in the Avoca River; including deepening of the river channel, the introduction of new debris and gravel traps and strengthening works to the existing quay walls and Arklow Bridge. The Avoca River is tidal in the Arklow area and some of the proposed development will be located in the foreshore. Future maintenance of the Arklow FRS will also be carried out.

A full description of the proposed development is provided in **Section 2.2**

Given the nature of the proposed activities, the project impact mechanisms of concern with respect to potential *ex situ* effects to the SCI bird species are:

- 1 Discharges
- 2 Loss of in-river habitats
- 4 Loss of habitat at Arklow pNHA

3.3. Description of Receiving Environment

It was concluded in screening exercise in **Section 2** that the proposed development has the potential to result in significant *ex situ* effects to 7 SCI species of 12 SPAs. Descriptions of the ecology of the above species (habitat preference and typical diet *etc.*) are presented in **Section 2.4.3.4**. **Table 3.1** and **Table 3.2** list the Conservation Objectives set for the SCI species at the SPA sites; generic Conservation Objectives have been set for 7 (of 12) SPAs (see **Table 3.1**) while site specific Conservation Objectives have been set for 5 SPAs (see **Table 3.2**). The national population figures and trends of the SCI species as reported under the Bird Directive Article 12[41] for the period 2008 – 2012 are listed in **Table 3.3**.

Table 3.1: Generic Conservation Objectives

SPA	SCI	Conservation Objective
The Murrough SPA (NPWS 2021[42])	Black-headed Gull (*Chroicocephalus ridibundus*)	To maintain or restore the favourable conservation condition
	Wigeon (*Anas penelope*)	
Cahore Marshes SPA (NPWS 2021[43])	Lapwing (*Vanellus vanellus*)	
	Wigeon (*Anas penelope*)	
Poulaphouca Reservoir SPA (NPWS 2021[44]),	Lesser Black-backed Gull (*Larus fuscus*)	
Ireland's Eye SPA (NPWS 2021[45]),	Herring Gull (*Larus argentatus*)	
Tacumshin Lake SPA (NPWS 2021[46]),	Wigeon (*Anas penelope*)	
Lambay Island SPA (NPWS 2021[47])	Lesser Black-backed Gull (*Larus fuscus*)	
Skerries Islands SPA (NPWS 2021[48])	Herring Gull (*Larus argentatus*)	

[41] http://cdr.eionet.europa.eu/Converters/run_conversion?file=/ie/eu/art12/envuvesya/IE_birds_reports-14328-144944.xml&conv=343&source=remote#A082_B

[42] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004186.pdf

[43] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004143.pdf

[44] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004063.pdf

[45] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004117.pdf

[46] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004092.pdf

[47] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004069.pdf

[48] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004122.pdf

Table 3.2: Site Specific Conservation Objectives

SPA	SCI	Conservation Objective
Wexford Harbour and Slobs SPA (NPWS 2012[49])	Curlew (*Numenius arquata*)	To maintain the favourable conservation condition
	Lesser Black-backed Gull (*Larus fuscus*)	
	Oystercatcher (*Haematopus ostralegus*)	
	Wigeon (*Anas penelope*)	
Saltee Islands SPA (NPWS 2011[50]),	Herring Gull (*Larus argentatus*)	To maintain the favourable conservation condition
	Lesser Black-backed Gull (*Larus fuscus*)	
Ballymacoda Bay SPA (NPWS 2015[51])	Lesser Black-backed Gull (*Larus fuscus*)	To maintain the favourable conservation condition
Ballycotton Bay SPA (NPWS 2014[52]	Lesser Black-backed Gull (*Larus fuscus*)	To maintain the favourable conservation condition
Cork Harbour SPA (NPWS 2014[53])	Lesser Black-backed Gull (*Larus fuscus*)	To maintain the favourable conservation condition

Table 3.3: National population figures and trends of the SCI species

SCI	Population size (maximum number)	Trend
Black-headed Gull (*Chroicocephalus ridibundus*)	50,181 (number of individuals)	Unknown
Curlew (*Numenius arquata*)	27,830 (number of individuals)	Decrease
Herring Gull (*Larus argentatus*)	9,734 (number of pairs)	Unknown
Lapwing (*Vanellus vanellus*)	2,000 Lapwing	Decrease
Lesser Black-backed Gull (*Larus fuscus*)	10,363 (number of individuals)	Unknown
Oystercatcher (*Haematopus ostralegus*)	2,316 (number of pairs)	Unknown
Wigeon (*Anas penelope*)	56,350 (number of individuals)	Decrease

3.4. Impact Prediction

Assessment of potential adverse effects on SCI species is presented in **Section 3.4.1** below, while **Section 3.5** considers potential adverse effects on site integrity with respect to the attributes and targets defined for the SCIs in site specific Conservation Objectives. Potential effects in-combination with other projects and plans is presented in **Section 3.7**.

[49] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004076.pdf

[50] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004002.pdf

[51] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004023.pdf

[52] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004022.pdf

[53] https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004030.pdf

3.4.1. Birds Directive SCI Species

3.4.1.1. Impact Mechanism 2 - Loss of in-river habitat and Impact Mechanism 4 - Loss of habitat at Arklow Town Marsh pNHA

The construction of the flood wall and installation of the embankment at Arklow Town Marsh pNHA will result in loss of river habitat and habitats (**Figure 2-23**).

Based on the foraging distances and feeding behaviour (feeding guilds, habitat preference and typical diet *etc.*) of Black-headed Gull, Curlew, Herring Gull, Lapwing, Lesser Black-backed Gull, Oystercatcher and Wigeon) there are six terrestrial habitat types likely to be suitable to the SCI species and possibly used by the species; the terrestrial habitats possibly used by the species are:

- GA1 Improved agricultural grassland / GS4 Wet grassland
- FS1 Reed and tall sedge swamp
- WL2 Treelines
- WS1 Scrub
- FS2 Tall-herb swamp
- GS4 Wet grassland

In addition to the terrestrial habitats listed above, the aquatic habitat CW2 Tidal Rivers / FW2 Depositing Lowland Rivers, which includes the in-stream vegetated islands and gravel bank located upstream of the Arklow bridge, is of importance to the SCI species. Estimates of the extent of the terrestrial and aquatic habitats lost due to the installation of flood walls and embankment, and the removal of in-stream vegetated islands and the gravel bank, is presented in **Table 3.4**.

While the proposed development will result in the loss of parts of terrestrial habitat types within the Arklow Town pNHA likely to be used by SCI species, in each case, the area of habitat lost relative to the total area of the habitats area within the Arklow Town March pNHA is small. As the area of terrestrial habitats lost is small relative to the area available to the species, there is **no risk of significant adverse** of *ex situ* effects to the SCIs.

Within the aquatic habitat CW2 Tidal Rivers / FW2 Depositing Lowland Rivers, the vegetated islands provide roosting for bird species while birds, in particular gulls, use the gravel banks to roost on, and bathe and preen in the water of the river. The removal of the vegetated islands and gravel bank will result in the loss of approximately 0.2 ha of habitat potentially used by the SCI bird species. The area lost is extremely small relative to the extent of habitat used by the SCI bird species in the area and within SPA sites designated for the species. Consequently, it is concluded that there will be **no risk of significant** *ex-situ* effects to SCI species due to habitat loss.

Table 3.4: Area of habitats lost.

Habitat (Fossitt classification)	Hectares Lost Habitat within pNHA and planning boundary	Hectares Lost Habitat outside pNHA but within planning boundary	Total Hectares Lost
GA1 Improved agricultural grassland / GS4 Wet grassland	1.37	0.83	2.20
FS1 Reed and tall sedge swamp	1.05	0.28	1.33
WL2 Treelines	0.31	-	0.31
WS1 Scrub	0.19	-	0.19
FS2 Tall-herb swamp	0.01	-	0.01
GS4 Wet grassland	0.12	-	0.12
CW2 Tidal / FW2 Depositing Lowland Rivers	0.20	-	0.20

3.4.1.2. Impact Mechanism 1 - Discharges

There is potential that without the implementation of construction best practice and mitigation measures, activities during the construction of the embankment at Arklow Town Marsh pNHA could result in the uncontrolled release of sediment material to the nearby river and habitat types likely to be used by the SCI species, affecting the availability of food items targeted by foraging birds. Similarly water runoff from stockpiles of excavated material could impact SCI bird foraging at the habitats through the introduction of sediment and chemical pollutants. Mitigation measures and the general construction practices required to prevent adverse effects are detailed in **Section 3.6**.

In addition, there is potential that construction activities may result in the accidental release of chemical or other waste material pollution to nearby terrestrial habitats and watercourses. Potential chemical and pollutants associated with construction plant equipment include fuels, oils, greases and hydraulic fluids. Hydrocarbon spills from poorly secured or non-bunded fuel storage areas, leaks from vehicles or plant or spills during re-fuelling can all give rise to the escape of hydrocarbons from construction sites. Accidental release of hydrocarbons from plant machinery and fuel stocks, and organic polymers or heavy metals associated with cementing/ concreting materials used for construction activities. These materials are toxic to organisms in sufficient quantities and will potentially contaminate the seabed sediments adjacent to the project, inhibiting recolonisation of the area after construction and dredging. Accidental release of chemicals and pollutants must be controlled to ensure risk of impacts are minimised. Mitigation measures to prevent release of chemical and pollutants from construction plant equipment are detailed in **Section 3.6**.

As outlined above, HCC water from the stockpiles of excavated dredge material and the constructed flood embankment will percolate into the ground. The HCC water will disperse in the generally vicinity of the percolation and be ultimately diluted by groundwater. The maximum depth of dredging will be approximately 1.0m. Median salinity levels of sediments 1m below river bed is approximately 62mg/l. The median salinity level of groundwater in the area is 50mg/l, while the EPA reports salinity levels in the Avoca River (around the bridge) at approximately 1500mg/l (*i.e.* 1.5ppt). Any effect of HCC water on the salinity levels of groundwater would be negligible and significantly less than the current natural periodic flooding of the marsh area by the Avoca.

3.5. Potential for Adverse Effects on Site Integrity

The assessment of the potential impact of a project or plan on the integrity of SPAs is undertaken in relation to the site specific Conservation Objective attributes and targets. The provisions of Article 6 defines 'integrity' as the 'coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and / or population of species for which the site is or will be classified'. Conservation Objective attributes and targets broadly relate to;

1. characteristics of the SPA site and,
2. characteristics of the SCI populations.

Attributes and targets related to **1** characteristics of the SPA sites include the extent of habitats (*e.g.* nesting, roosting, feeding habitats) available at the sites, disturbance levels at the habitats, prey biomass availability, barriers to connectivity *etc*. Given the distance of the SPAs from the development, there is no risk of significant adverse effects with respect to site attributes and targets.

Attributes and targets related to **2** characteristics of SCI populations include; population sizes, population trends, species productivity (*e.g.* density of breeding pairs) *etc.* While the pNHA and surrounding areas provide suitable habitat and foraging opportunities for the SCI species, it should be noted that the species do not occur in the area in high numbers. While in absence of mitigation there may be potential effect to individual birds, there is no risk of significant adverse population level effects.

3.6. Mitigation Measures

This will take into account measures presented in the Arklow FRS Construction Environmental Management Plan (CEMP) (see **Appendix 4**) regarding construction activities including any that are required to ensure no significant release of sediment laden water and runoff chemicals or other waste material pollution into the marsh area. Arklow Town Marsh pNHA and the river area will be protected

from runoff by the installation of a temporary low bund constructed of impermeable material. It will be situated along the western boundary and will redirect surface water run off towards siltation traps. Dredge material will be managed in an area situated on the south eastern portion of SC1 behind Circle K filling station. A low bund will be installed around the area on top of geotextile membrane and hardcore material. A localised stormwater drainage system will be constructed within the area to convey runoff to a sedimentation collection system before percolating into the ground. The collection system will be periodically monitored during material testing. Silt fences will be installed around stockpiled material. These measures will ensure the likelihood of impacts is low.

Measures will also include standard construction best practice used to manage the risk of potential for loss of grout/ concrete or hydrocarbons such as diesel and hydraulic fluids during the construction phase. Careful supervision of concrete handling, curing times, and general construction practice will reduce the risk from concrete-related impacts so that the likelihood of impacts is best described as low. Just like cement, the implementation of general construction practice will ensure that the likelihood of pollution in a well-equipped, maintained and managed construction site is low.

3.7. Plans or Projects That Might Act In-Combination

The screening assessment presented in **Section 2.4.4** identified potential for effect in combination with the following other plans or projects:

- Circle K Safeway Service Station (20426).
- Irish Water - Arklow Waste Water Treatment Plan (FS006862).

Assessment of the potential effects of the Arklow FRS development in combination with above plans or projects are presented below.

3.7.1. Circle K Safeway Service Station

The project involves the demolition of the existing, and construction of a new, fuel forecourt at the service station, which is located adjacent to Arklow Town Marsh and SC1 of the proposed scheme. Both the Circle K project and Arklow FRS develop carry a risk of generation of discharges.

The screening exercise for the proposed FRS development identified the risk of potential *ex situ* effects to 7 SCI species of 12 SPAs (listed in **Table 3.1**) due to habitat loss and project discharges. However, as demonstrated in **Section 3.4**, given the relative size of the habitat areas potentially affected by discharges there is no risk of significant adverse effects to the SCI species of the SPAs. Consent to undertake the Circle K project will be subject to conditions that will require that activities are

undertaken to ensure significant impact associated with discharges do not occur. Given the above, it can be concluded that significant adverse in combination effects will not occur

3.7.2. Irish Water - Arklow Waste Water Treatment Plan

This main aim of the proposed Arklow Town WwTP development is to collect and appropriately treat the wastewater generated in Arklow town (which currently discharges untreated wastewater to the Avoca River) such that the treated effluent complies with national and EU standards. Interceptor sewers proposed along the North and South Quays in Arklow will intercept the existing wastewater flows and convey them to the proposed wastewater treatment plant (WwTP). The proposed location of the WwTP is at the Old Wallboard Site at Ferrybank, immediately adjacent to the North Quay (on the northern bank of the Avoca River) and the Irish Sea. The final treated effluent from the WwTP will discharge into the Irish Sea via a *ca.* 900m long outfall pipe with a diffuser section at its end. The NIS for the Arklow Town WwTP identified potential effects to

- Buckroney – Brittas Dunes and Fen SAC (Site Code 000729)
- Kilpatrick Sandhills SAC (Site Code 001742)
- Magharabeg Dunes SAC (Site Code 001766).

As demonstrated in the screening exercise undertaken for the FRS development, the above listed SACs lie outside of the ZoI of the development; consequently, it is concluded that significant adverse in combination effects will not occur.

3.8. Outcomes and Conclusions

A total of 7 SCI species of 12 SPAs for which potential significant impacts could occur has been identified.

Mitigation measures have been developed and proposed, with the purpose of avoiding impacts on the SCIs and Conservation Objective of the SPAs. The likely success of these measures was also considered and no difficulties in their effective implementation were identified.

The provisions of Article 6 of the 'Habitats' Directive 92/43/EC (2000) defines 'integrity' as the 'coherence of the site's ecological structure and function, across its whole area, or the habitats, complex of habitats and / or population of species for which the site is or will be classified'. The European Commission publication Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC (EC, 2018), states that the integrity of the site can be usefully defined as the coherent sum of the site's ecological structure, function and ecological processes, across its

whole area, which enables it to sustain the habitats, complex of habitats and/or populations of species for which the site is designated"

Following a comprehensive evaluation of the potential direct, indirect and cumulative impacts on the SCIs in light of their Conservation Objectives, it has been concluded that the proposed development will not have an adverse effect on the integrity of the site or any other European site.

This NIS has examined and analysed, in light of the best scientific knowledge, with respect to those European sites within the Zone of Impact of the proposed development, the potential impact sources and pathways, how these could impact on the sites SCI species and whether the predicted impacts would adversely affect the integrity of the European sites.

Following a comprehensive evaluation of the potential direct, indirect and cumulative impacts on the SCIs with respect to the Conservation Objectives of the SPA listed in **Table 3.1**, it has been concluded that the proposed development will not have an adverse effect on the integrity of the sites or any other European site.

Mitigation measures are set out within this report and the (CEMP) (see **Appendix 4**)**,** and they ensure that any impacts on the Conservation Objectives of European sites will be avoided during the construction and operation of the proposed development such that there will be no risk of adverse effects on these European sites.

It has been objectively concluded by AQUAFACT, following an examination, analysis and evaluation of the relevant information, including in particular the nature of the predicted impacts from the proposed development and with the implementation of the mitigation measures proposed, that the proposed development does not pose a risk of adversely affecting (either directly or indirectly) the integrity any European site, either alone or in combination with other plans or projects, and there is no reasonable scientific doubt in relation to this conclusion.

4. References

DAHG NPWS (2012) Marine Natura Impact Statements in Ireland Special Areas of Conservation, A Working Document. https://www.npws.ie/sites/default/files/general/Marine%20Assessment%20Working%20Document.pdf

DEHLG (2009) Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities (Revised 2010). https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2009_AA_Guidance.pdf

EC (2018) Managing Natura 2000 sites. The provisions of Article 6 of the Habitats Directive 92/43/EEC Commission Notice (2018). https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/EN_art_6_guide_jun_2019.pdf

EC (2001) Managing Natura 2000 Sites: The provisions of Article 6 of the Habitats Directive 92/43/EEC. https://ec.europa.eu/environment/nature/natura2000/management/docs/art6/provision_of_art6_en.pdf

NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill. https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol2_Habitats_Article17.pdf

NPWS (2019). The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments. Unpublished NPWS report. Edited by: Deirdre Lynn and Fionnuala O'Neill. https://www.npws.ie/sites/default/files/publications/pdf/NPWS_2019_Vol3_Species_Article17.pdf

Screening Statement for Appropriate Assessment and Natura Impact Statement

Appendix 1

Arklow Town Marsh pNHA Site Synopsis Report

NIS Appendix 1

Arklow Town Marsh pNHA

Site Synopsis Report

SITE SYNOPSIS

SITE NAME: ARKLOW TOWN MARSH

SITE CODE: 001931

This site is now the principal wetland area in Arklow. It is a large marsh located north of the Avoca estuary on the perimeter of Arklow town. A disused roadway bisects the site from east to west.

Much of the site is dominated by Common Reed (*Phragmites australis*), with Creeping Bent (*Agrostis stolonifera*) and Common Valerian (*Valeriana officianalis*) common in places. On the southern side, numerous scattered bushes of willow (*Salix* spp.) are growing among the Common Reed, forming a scrub in places. Drier areas are characterised by large tussocks of Tufted Hair-grass (*Deschampsia cespitosa*). Other plants present include Soft Rush (*Juncus effusus*), Yellow Iris (*Iris pseudacorus*), Skullcap (*Scutellaria galericulata*), Lesser Pond-sedge (*Carex acutiformis*) and several other sedges (*Carex* spp.).

Wet grassy areas with extensive stands of Water Horsetail (*Equisetum fluviatile*) occur on the north-east margin, with Creeping Bent, Common Spike-rush (*Eleocharis palustris*), Meadowsweet (*Filipendula ulmaria*) and rushes (*Juncus articulatus* and *J. conglomeratus*) present.

The scarce Broad-leaved Cottongrass (*Eriophorum latifolium*) has been recorded growing on this site.

Much of the willow has been defoliated, possibly due to atmospheric pollution from the nearby fertiliser factory.

The importance of this site is that it is a good example of a relatively large wetland, despite the impacts of atmospheric pollution and its proximity to Arklow town. The presence of at least one scarce plant species increases the interest of the site.

7.12.2009

Screening Statement for Appropriate Assessment and Natura Impact Statement

Appendix 2

EIAR Chapter 10-Biodiversity and Appendices

NIS Appendix 2

EIAR Chapter 10-Biodiversity and Appendices

10 Biodiversity

10.1 Introduction

This chapter describes the likely significant direct and indirect effects of the proposed flood relief scheme on biodiversity, including flora (plants), fauna (animals) and habitats in both the terrestrial and aquatic environment.

Chapter 4 *Description of the Proposed Scheme* provides a full description of the proposed development whilst **Chapter 5** *Construction Strategy* describes the construction aspects of the scheme. The following aspects are particularly relevant to the biodiversity assessment:

- Design:
  - The landscaping at Arklow Marsh (adjacent to the proposed embankment) and the extension to the north riverbank upstream of Arklow Bridge will provide some opportunities for habitat creation and mitigation of direct and indirect effects on biodiversity due to the loss of in-river vegetated islands and loss of habitat in the marsh.
  - The proposed installation of three roosting platforms in the river channel upstream of Arklow Bridge will provide for some mitigation of direct and indirect effects on birds due to the loss of in-river gravel beds due to the river dredging works.
  - Bat boxes and bat tubes will be permanently installed in the arches of Arklow Bridge (upstream side), in the flood walls and in the RC columns of the debris trap to mitigate direct and indirect effects on bats due to the construction works at Arklow Bridge.
  - The increase in levels of sections of the riverbank along River Walk and South Bank will provide some opportunities for riparian habitat creation and refuge areas to mitigate direct and indirect effects of the river dredging works on aquatic mammals and birds.
- Operation:
  - Maintenance activities in the river have the potential to impact on aquatic biodiversity, specifically, the maintenance of the gravel and debris traps and occasional channel dredging.
- Construction:
  - Construction activities occurring within the Avoca River channel including river dredging, works at Arklow Bridge have the potential to impact on aquatic ecology;
  - The construction of some of the flood walls along Riverbank and South Bank will encroach into the river thereby resulting in habitat loss along the riverbank;

- Construction activities in Arklow Marsh, along the southern bank of the river and the site compounds have the potential to impact on terrestrial biodiversity. Specifically, some of the working areas will require tree removal and vegetation clearance to accommodate construction activities;
- Some of the site compounds will be used to temporarily store dredge material for archaeological examination and stockpiling. There is potential for impact on biodiversity due to run-off from the dredge material;
- Construction activities will be undertaken in the vicinity of invasive plant species.

10.2 Methodology

10.2.1 General

The biodiversity assessment addresses the likely significant direct and indirect effects of the proposed development on terrestrial and aquatic biodiversity, including flora, fauna and habitats in proximity to the site.

The assessment has been carried out in three stages:

1. A desk study was undertaken to review published data describing ecological conditions within the greater area of the proposed development. Data bases included the National Parks and Wildlife Service (NPWS), the National Biodiversity Data Centre (NBDC), Inland Fisheries Ireland (IFI), Birdwatch Ireland (BWI) and the Irish Whale and Dolphin Group (IWDG).
2. Site visits and field surveys by specialist ecologists to establish the existing ecological conditions within the footprint of the proposed FRS and within the vicinity of all of the proposed development elements. The site visits and field surveys included terrestrial, river and estuarine surveys.
3. Evaluation of the proposed development and determination of the scale and extent of likely direct and indirect significant effects on biodiversity (*i.e.* flora, fauna and habitats) and the provision of appropriate mitigation and monitoring.

The biodiversity assessment for this EIAR and the NIS was prepared by AQUAFACT International Service Ltd. Other specialist ecologists who contributed included:

- Brian Keeley Ecologist and bat licensed specialist carried out bat surveys and assessments; and
- Denyer Ecology carried out a survey of bryophytes in the area around Arklow Bridge.

Walk over site surveys were also jointly commissioned by Wicklow County Council and Irish Water for the Arklow FRS and the Arklow Wastewater Treatment Plant (WwTP) projects.

The description of the baseline environment is therefore informed by environmental documents prepared for the Arklow WwTP project3. Relevant details of those surveys are included in this report where necessary. The ecologists who carried out the joint field surveys for the FRS and WWTP are listed in Section 10.2.4 below.

10.2.2 Guidance and Legislation

The biodiversity assessment has been prepared with reference to the following legislation and guidance:

- Wildlife Act 1976, as amended;
- European Communities (EC) (Birds and Natural Habitats) Regulations 2011, as amended;
- Council Directive 2009/147/EEC, *i.e.* Birds Directive;
- Council Directive 92/43/EEC (as amended), *i.e.* Habitats Directive;
- Flora (Protection) Order, S.I. No. 356 of 2015;
- Heritage Council (2011) Best Practice Guidance for Habitat Survey and Mapping;
- Fossitt (2000) A Guide to Habitats in Ireland;
- Transport Infrastructure Ireland (incorporating the National Roads Authority, Revision 1, December 2010). Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Road Schemes;
- National Parks and Wildlife Service, Department of Environment Heritage and Local Government (2006) Bat Mitigation Guidelines for Ireland;
- Department of Arts, Heritage and the Gaeltacht – National Parks and Wildlife Service DAHG NPWS (2012) Marine Natura Impact Statements in Ireland Special Areas of Conservation, A Working Document.
- DEHLG (2009) Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities (Revised 2010);
- EC (2018) Managing Natura 2000 sites. The provisions of Article 6 of the Habitats Directive 92/43/EEC Commission Notice (2018);
- EC (2001) Managing Natura 2000 Sites: The provisions of Article 6 of the Habitats Directive 92/43/EEC;
- EC (2002) Assessment of plans and projects significantly affecting Natura 2000 sites;
- EU (2013) Guidelines on Climate Change and Natura 2000: Dealing with the impact of climate change on the management of the Natura 2000 Network of areas of high biodiversity value;

[3] Arklow Wastewater Treatment Plant Project Environmental Impact Assessment Report (Arup, 2018a) and Natura Impact Statement (Arup, 2018b) are available at https://www.water.ie/planning-sites/arklow-wastewater/environmental-documents/

- CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal;
- Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries during Construction Works in and adjacent to Waters;
- EPA (2017) Draft Guidelines on the Information to be Contained in Environmental Impact Assessment Reports; and
- EU (2017) Guidance on the preparation of the EIA Report (Directive 2011/92/EU as amended by 2014/52/EU);
- NPWS (2017) National Biodiversity Action Plan 2017-2021;
- Heritage Officer WCC - Wicklow Biodiversity Action Plan 2010-2015; and
- National Biodiversity Date Centre (NBDC) - All Ireland Pollinator Plan 2015-2020.

10.2.3 Study Area

The study area for the biodiversity assessment was defined to include all areas associated with the proposed development including permanent works, temporary working areas and construction compounds. Thus, the study area focussed on the lands within the planning boundary for the proposed flood relief scheme as shown on **Figure 10.1.** Refer also to Drawing no 1065 in Appendix 4.1 for further details on locations of temporary working areas and construction compounds (**Figures 10.2** and **10.3** below are extracted from Drawing no 1065). Some adjoining lands were included in the study area where relevant in order to provide context and baseline information on baseline ecological conditions in the vicinity of the proposed development.

As noted previously, walk over site surveys were jointly commissioned by Wicklow County Council and Irish Water for the Arklow FRS development and the Arklow WwTP project. Therefore, the study area of some of those surveys extended far beyond the planning boundary of and zone of influence for the FRS (for example; bat surveys and freshwater macroinvertebrate surveys along the Avoca River upstream at M11 bridge, terrestrial and waterbird surveys at Arklow Pond, benthic offshore surveys for the WwTP outfall). The relevant data have been extracted from these surveys to inform the biodiversity assessment of the FRS. The description of the baseline environment is also informed by environmental documents prepared for the Arklow WwTP project.

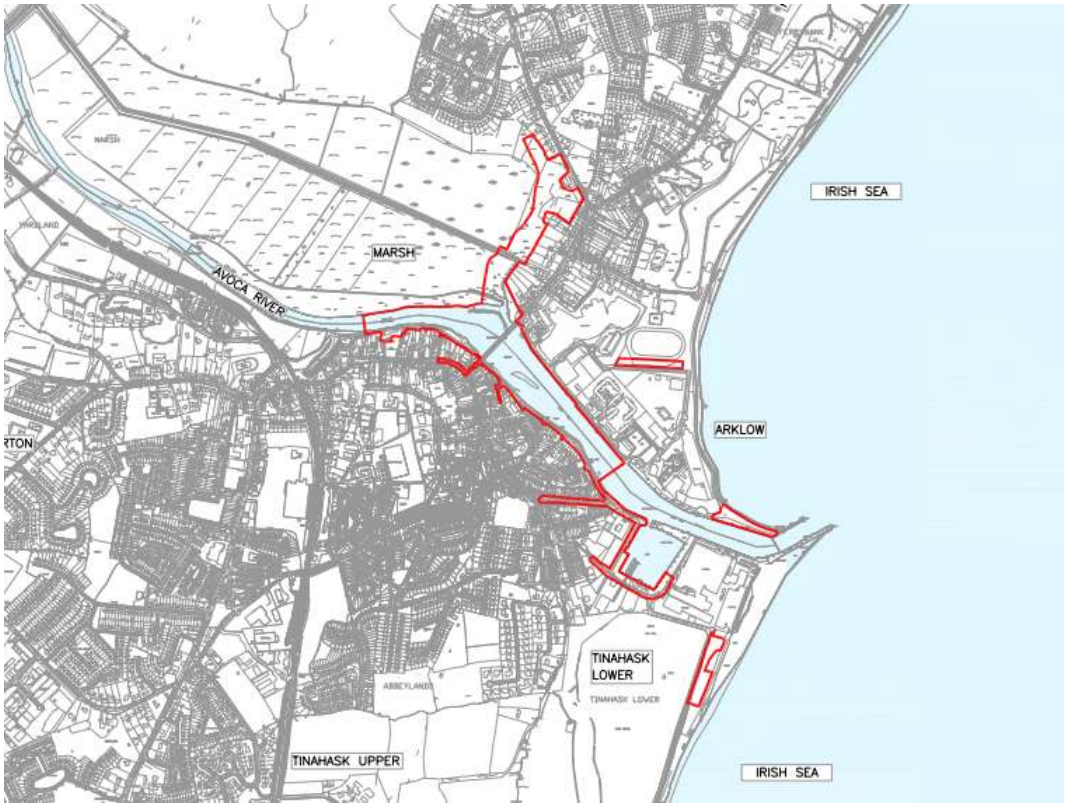


Figure 10.1: Arklow FRS planning boundary (extracted from Drawing No 1001 of Appendix 4.1 as described in Chapter 5). Red line represents planning boundary which includes all permanent works and temporary working areas required for the scheme. Do not scale

Figure 10.2: Site Compounds **(extracted from Drawing No 1065 as described in Chapter 5). Site Compound 1 (SC1) located in Arklow Marsh, SC3 located on north bank (Ferrybank), SC2 located to the east near running track, SC4 located at Main St carpark on south bank near Riverwalk. Do not scale**

Figure 10.3: Site Compounds **(extracted from Drawing No 1065 and in Chapter 5). Site Compound 5 (SC5) located at North Pier, SC6 located at South Beach. Do not scale**

10.2.4 Consultation

In its response to the 2018 Scoping Report, the Department of Culture, Heritage and Gaeltacht (on behalf of NPWS) provided a number of comments to inform the content and scope of the EIAR including:

- Guidance and legislation to be consulted
- Assessment of project effects
- Ecological surveys and baseline data
- Specific species data, alien invasive species
- Cumulative effects
- Mitigation and monitoring measures

Consultation meetings were held with IFI on 16 March 2018, and with NPWS on 27 June 2018, in respect of the proposed development and the proposed WwTP. Issues discussed relating to the FRS included the following:

- An overview of the project was provided;
- Discussion on the design development and baseline biodiversity studies undertaken including overview of Arklow Town Marsh proposed Natural Heritage Area (pNHA) and its habitats together with invasive plant species;
- Habitats Directive Annex II listed fish species that migrate through the Avoca Estuary, potential for River Lamprey adults and ammocoete larvae to be present in works areas, protocols to remove/protect fish during construction, and seasonal restrictions of in-stream works;
- Water quality protection during construction; and
- Habitats Directive Annex IV listed bat species, roost locations including Arklow Bridge, requirements for bat derogation licence and mitigation.

Inland Fisheries Ireland provided Avoca River Estuary fish data from monitoring carried out under the Water Framework Directive in 2015.

Consultation meetings were also held with IFI on 18 November 2020, and with NPWS on 5 November 2020, in respect of the proposed development. Issues discussed included the following:

- An overview of the changes to project design since the previous 2018 consultation;
- Discussion on bat surveys and bat derogation licence
- Discussion baseline biodiversity surveys undertaken in Arklow Town Marsh pNHA,
- Potential impacts on aquatic habitats and fauna due to in-stream works, water quality protection during construction;

- Habitats Directive Annex II listed fish species that migrate through the Avoca Estuary, potential for River Lamprey adults and larvae to be present in works areas, protocols to remove/protect fish during construction, and seasonal restrictions of in-stream works; and
- A bryophyte survey on Arklow Bridge.

Regard has been given to the consultations above and the relevant details have been incorporated into the impact assessment in this chapter.

10.3 Categorisation of the Baseline Environment

10.3.1 Desk Study

The desk studies carried out to inform the categorisation of the baseline environment information held by the following:

- NBDC database;
- EPA;
- IFI reports and data;
- Bat Conservation Ireland database;
- Wetland Surveys Ireland database; and
- I-WeBS data held by BirdWatch Ireland. The Irish Wetland Bird Survey (I-WeBS) is a joint scheme of BirdWatch Ireland and the NPWS.

The categorisation of the baseline environment was also informed by desk-based review of available records of protected species and habitats including the following sources:

- Conservation Status Assessment Reports, Backing Documents and Maps prepared to inform national reporting required under Article 17 of the Habitats Directive[4] and Article 12 of the Birds Directive[5];
- Site Synopsis, Conservation Objective Reports and Natura 2000 Standard Data Forms available from NPWS;
- Published and unpublished NPWS reports on:
    - protected habitats and species including Irish Wildlife Manual reports,
    - Species Action Plans and
    - Conservation Management Plans; and

[4] The most recent Article 17 report *The Status of EU Protected Habitats and Species in Ireland 2019* is available at https://www.npws.ie/publications/article-17-reports/article-17-reports-2019

[5] https://www.npws.ie/status-and-trends-ireland%E2%80%99s-bird-species-%E2%80%93-article-12-reporting

- Existing relevant mapping and databases *e.g.* waterbody status, species and habitat distribution *etc*. sources of information included:
    - EPA - http://gis.epa.ie/,
    - NBDC - http://maps.biodiversityireland.ie and
    - NPWS - http://www.npws.ie/mapsanddata/.

10.3.2 Site Visits and Surveys

The categorisation of the baseline environment was also informed by site visits and surveys carried out for the proposed Arklow FRS development and the Arklow WwTP project.

10.3.2.1 Overview

Table 10.1 briefly lists the site visits and surveys commissioned specifically for the Arklow FRS development while **Table 10.2** lists surveys jointly commissioned for the Arklow FRS development and the Arklow WwTP project.

Table 10.1 and **Table 10.2** also indicate where in this section additional information of the site visits and surveys is provided.

Table 10.1: Biodiversity site visits/ surveys undertaken for the Arklow FRS development

Biodiversity Element	Site Visit/ Survey Details	Dates	Notes	Refer to:
Terrestrial habitat and plant species surveys	Terrestrial habitat and plant species walk-over surveys[6, 7]	July/ August 2020	A series of walkover terrestrial habitat and species surveys carried out by AQUAFACT specifically for the FRS.	See **Section 10.3.3.1**
	Bryophyte survey	November 2020	Survey of bryophytes in the area around Arklow Bridge carried out in November 2020 by Denyer Ecology.	See **Section 10.3.3.2**
	Habitat survey for *Equisetum x moorei* near Site Compound 6 (SC6)	December 2020	Specific habitat survey for *Equisetum x moorei* undertaken near SC6. This survey was carried out by AQUAFACT.	See **Section 10.3.3.3**
	Terrestrial baseline studies	June 2017	Arklow Town Marsh surveyed by Natura Consultants to inform baseline studies for the proposed FRS	See **Section 10.3.3.1**
Bird species	Breeding Birds Survey at Arklow Town Marsh pNHA	26 Apr 2017, 03 May 2017, 26 May 2017	Breeding Birds Survey undertaken at Arklow Town Marsh pNHA by Natura Environmental Consultants.	See **Section 10.3.3.3**
Bat species	Bat Survey Arklow Bridge and Arklow Marsh	December 2020	Bat survey at Arklow Bridge carried out by Brian Keeley to inform Bat Derogation licence and bat mitigation.	See **Section 10.3.5**
Marine Invertebrates and Habitat	Benthic survey	August 2020	Survey in the lower part of the Avoca Estuary of carried out by AQUAFACT to document the conditions in terms of sediment quality and benthic infaunal invertebrate communities present.	See **Section 10.3.9**

[6] These surveys also recorded observations on evidence of terrestrial mammals. These observations are detailed in **Section 10.3.6**

[7] The findings of the survey with respect to invasive species are described in **Section 10.4.5.8.**

Table 10.2: Biodiversity joint site visits/ surveys undertaken for the Arklow WwTP and the Arklow FRS development

Biodiversity Element	Site Visit/ Survey Details	Details	Notes	Refer to:
Terrestrial habitat and plant species surveys	Flora and habitat and breeding bird surveys	27 June 2016, 10 August 2016, 26 April 2017, 22 August 2017, 12 April 2018, 16 May 2018	Some of the surveys were carried out within the planning boundary of the FRS. The relevant results of the surveys informed the assessment.	See **Section 10.3.3.1**
	Invasive plant species surveys	10 August 2016, 26 April 2017, 22 August 2017, 12 April 2018, 16 May 2018		See **Section 10.3.3.1**
Bird species	Waterbird surveys	16 September 2016, 25 October 2016, 24 November 2016, 8 December 2016, 28 January 2017, 24 February 2017, 29 November 2017, 13 February 2018		See **Section 10.3.3.3**
Bat surveys	Bat survey River Walk, Arklow Castle, The Alps, Arklow Bridge, and the northern bank of the Avoca River at Ferrybank including Brigg's Lane	17 October 2016, 19 October 2016, 22 to 29 August 2017	Survey carried out for the Arklow FRS development and Arklow WwTP project carried out by Brian Keeley. Some of the surveys (*e.g.* north bank and Arklow Bridge) were carried out within the planning boundary of the FRS. The other surveys (*e.g.* Arklow Castle and Alps) provide general information on bat activity in vicinity of Arklow town.	See **Section 10.3.5**
Estuarine and marine benthic survey		24 April 2017	Survey for the Arklow FRS development and Arklow WwTP project carried out by BEC. Some of the stations were carried out within the planning boundary of the FRS just downstream of Arklow Bridge.	See **Section 10.3.8**
Freshwater macroinvertebrate survey		26 September 2017	Survey for the Arklow FRS development and Arklow WwTP project carried out by BEC. Two of the stations (S1, S2) were carried out within the planning boundary of the FRS.	See **Section 10.3.7**

10.3.2.2 Appendix List

The Appendices which accompany this chapter are listed below

Appendix No	Title
10.1	Habitat survey report for *Equisetum x moorei* near SC6 (Dec 2020) and Addendum (Feb 2021)
10.2	Bat Survey Report (2017) (Appendix 11.4 of Arklow WwTP)
10.3	Bat Derogation Licence & Application (2021)
10.4	Aquatic Ecology Report (Appendix 11.6 of Arklow WwTP)
10.5	European Site Synopsis Reports
10.6	pNHA Site Synopsis Report
10.7	Bryophyte Survey at Arklow Bridge Report

10.3.3 Terrestrial Habitat and Plant Species Surveys

10.3.3.1 Walkover surveys

A series of walkover terrestrial habitat and species surveys surveys carried out by AQUAFACT specifically for the Arklow FRS development. Walkover flora and habitat surveys were carried out within the Arklow FRS development planning boundary and areas adjacent to the boundary to determine species composition and distribution in the study area

Where the walkover surveys undertaken by AQUAFACT covered areas previously surveyed for the Arklow WwTP, the previous survey findings were updated and/ or verified.

The walkover surveys undertaken by AQUAFACT in 2020 followed the same methodology as those survey undertaken for the Arklow Arklow WwTP.

Habitats present were classified in accordance with Fossitt[8], and also having regard to Heritage Council[9], in order to provide a basis for habitat evaluation. Plant species scientific nomenclature follows Parnell and Curtis[10], common names follow Scannell and Synnott[11] when common names are not given in Parnell and Curtis.

The walk-over surveys also included checks for the presence of invasive non-native plant species listed in Part 1 of the Third Schedule[12.] Additional species listed as invasive non-native plant species in the TII Guidelines[13] were also recorded, together with non-native species encountered that can be spread through distribution of plant material

Some of the habitats are small scale within the urban landscape of the proposed development and have been subject to change during the course of the baseline studies; they are therefore described in the text provided rather than by habitat mapping.

Further detail of the walkover terrestrial habitat and species surveys undertaken by AQUAFACT are provided in **Section 10.4.5**

10.3.3.2 Bryophyte Survey

A bryophyte survey was carried out by Denyer Ecology at Arklow Bridge in November 2020. The findings of the survey are also described in **Section 10.4.5.7.** The full details of the survey are provided in **Appendix 10.7**.

10.3.3.3 Habitat Survey for *Equisetum x moorei* survey

Curtis and Wilson (2007[14]) recorded *Equisetum x moorei* (*Equisetum hyemale x ramosissimum*) at Site Compound 6 (SC6) in July 2007. A site specific habitat survey for *Equisetum x moorei* was carried out by AQUAFACT in December 2020 at Site Compound 6 (SC6). The 2020 survey did not identify *Equisetum x moorei* at the site. Following the publication of the December 2020 survey report, the boundary of SC6 was modified to avoid directly impacting on the area where *Equisetum x moorei* was recorded in 2007.

[8] Fossitt, Julie A (2000). A Guide to Habitats in Ireland. The Heritage Council.

[9] Best Practice Guidance for Habitat Survey and Mapping (Heritage Council, 2011)

[10] Parnell, John, and Tom Curtis (2012). Webb's An Irish Flora. Cork University Press

[11] Scannell, Mary J.P, and Donal M. Synnott (1987). Census catalogue of the Flora of Ireland. Stationery Office, Dublin.

[12] Part 1 of the Third Schedule, European Communities (EC) (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011)

[13] https://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf and https://www.tii.ie/technical-services/environment/planning/Ecological-Surveying-Techniques-for-Protected-Flora-and-Fauna-during-the-Planning-of-National-Road-Schemes.pdf

[14] Curtis, T. and Wilson, F. 2007. Wicklow Rare/Threatened and Scarce Plant Survey 2007. *Equisetum x moorei*. National Parks and Wildlife Service.

The full details of the 2020 survey are provided in **Appendix 10.1**. The findings of the survey are also described in **Section 10.4.5.6**.

10.3.4 Bird Surveys

As part of the Arklow WwTP project a series of 26 bird surveys were undertaken over 3 survey areas between September 2016 and February 2018 (Arup, 2018a, b[15]). The survey areas were the Avoca River and Estuary, Arklow Pond, and nearby coastal waters.

The results of the survey with respect to survey areas within the Arklow FRS development boundary are described in **Section 10.4.6.1**.

In 2017 a survey of the populations of breeding birds at the Arklow Town Marsh proposed Natural Heritage Area (pNHA) was undertaken for the proposed FRS development.

The results of the survey at Arklow Town pNHA are detailed in **Section 10.4.6.3.**

10.3.5 Bat Surveys

There were a number of specific surveys that were jointly carried out by Brian Keeley for both the Arklow FRS development and the Arklow WwTP project between 2016-2017 as detailed in **Section 10.3.2** above. The report for the survey is included in **Appendix 10.2**. For clarity, this survey report was also included as *Appendix 11.4* in the WwTP EIAR and has been extracted directly from that EIAR and reproduced as **Appendix 10.2** for this FRS EIAR.

An additional survey was carried out in 2020 to confirm the presence of a bat roost at Arklow Bridge and to inform the bat derogation licence. The full details of the survey and bat derogation licence and application are provided in **Appendix 10.3.**

10.3.6 Otter Surveys

Two individuals (1 adult and 1 juvenile) were observed feeding along the southern bank in the early morning during the course of fieldwork carried out by AQUAFACT in summer of 2020.

During walkover survey undertaken as part of the Arklow WwTP project evidence of otter spraint was recorded at two locations along the south bank of the Avoca River between the M11 Bridge and the start of the built-up banks in Arklow Town upstream of the FRS planning boundary. Further detail is provided in **Section 10.4.9.**

[15] Arklow Wastewater Treatment Plant Project Environmental Impact Assessment Report (Arup, 2018a) and Natura Impact Statement (Arup, 2018b) are available at https://www.water.ie/planning-sites/arklow-wastewater/environmental-documents/

10.3.7 Freshwater Macroinvertebrate Survey 2017

The macroinvertebrate community of the Avoca River was sampled at six locations on the main channel and at one location (S7) on the channel that runs in a south-easterly direction through Arklow Town Marsh on 26 September 2017. The survey was carried out by BEC to inform both the Arklow FRS development and Arklow WwTP project. Two of the locations (S1, S2) were situated within the planning boundary of the FRS. The remaining five locations were situated further upstream. The full results of the survey are provided in **Appendix 10.4** and summarised in **Section 10.4.10.** For clarity, this survey report was also included as *Appendix 11.6* in the WwTP EIAR and has been extracted directly from that EIAR and reproduced as **Appendix 10.4** for this FRS EIAR.

10.3.8 Marine Macroinvertebrate Survey 2017

A benthic field survey was carried out by BEC on 24 April 2017 (jointly for the FRS and WwTP).

A total of 13 stations were sampled for macroinvertebrate and sediment analysis (granulometry and total organic carbon (TOC)). Three of these stations (S11, S12 and S13) were situated within the Avoca River Estuary, downstream of Arklow Bridge within the planning boundary of the proposed scheme and a therefore relevant to the proposed FRS. The remaining ten were located outside the breakwaters of Arklow Port which were relevant for the WwTP.

The results of the survey are provided in **Appendix 10.4.**

Macroinvertebrate sample analysis

In the laboratory, macroinvertebrate samples were logged to track the processing. Each freshwater macroinvertebrate sample was washed through a 1mm sieve and the residue transferred to a white tray for sorting. Macroinvertebrates present were removed and separated by major group for identification and enumeration.

Rose Bengal was added to the marine and estuarine macroinvertebrate samples on arrival in the laboratory in order to aid sorting.

After 72 hours, samples were transferred to 70% Industrial Methylated Spirits as preservative prior to sorting and identification. Samples were sorted in a white tray, with animals being transferred to labelled containers and preserved with 70% Industrial Methylated Spirits prior to identification.

The species lists produced were checked against the Pan-European Species directory Infrastructure[16]. Identification was carried out using stereoscopic and compound microscopes and appropriate keys.

Sediment sample analysis

Sediment analysis for granulometry and TOC was carried out by Nautilus, Dublin.

[16] PESI (2017) Pan-European Species directories Infrastructure. Accessed through www.eu-nomen.eu/portal on 2017-05-31.

Data analysis

On completion of estuarine and marine macroinvertebrate and sediment sample analysis, the data were used to describe the benthic environment. R-Statistic was used to carry out data analysis on the macroinvertebrate and sediment data. The following statistical analyses were undertaken:

- **Univariate ecological indices**: On completion of sorting and identification, several ecological univariate ecological indices were calculated to characterise the invertebrate community within the study area. These included Species Richness (number of species), Shannon-Wiener diversity index and Pielou's evenness index.
- **Community structure:** Abundance data were fourth-root transformed to down-weigh the importance of the highly abundant species and to give rarer species more importance (Clarke, 1993[17]) and used to calculate a Bray-Curtis similarity matrix.

  The similarity matrix was then used in cluster analysis to find sample groupings, *i.e.* samples within a group that are more similar to each other, than they are similar to samples in different groups. Similarity profile routine (SIMPROF) was used to identify significant ($P < 0.05$) groupings and the results were represented graphically on a dendrogram.
- **Sediment:** Sediment data were fourth-root transformed and normalised to equalise variance and standardise contributory importance of each variable.

  Cluster analysis based on Euclidian distances was used to find sample groupings, *i.e.* samples within a group that are more similar to each other, than they are similar to samples in different groups. Similarity profile routine (SIMPROF) was used to identify significant ($P < 0.05$) groupings and the results were represented graphically on a dendrogram.

The results of the survey are provided in **Appendix 10.4** and described in **Section 10.4.10.5.**

10.3.9 Marine Macroinvertebrate Survey 2020

A benthic survey of the lower part of the Avoca Estuary was carried out by AQUAFACT in August 2020 to document the conditions in terms of sediment quality and infauna present.

The AQUAFACT survey which followed the survey methodology outlined in **Section 10.2.6.7** is described in detail in **Section 10.4.10.5.**

[17] Clarke, K.R. (1993) Non-parametric multivariate analyses of changes in community structure. Australian Journal of Ecology 18: 117-143.

10.4 Baseline Conditions

10.4.1 Introduction

This section provides a description of the baseline environment of the proposed development area. A description of the desk studies, site visits and survey used to inform this section are detailed in **Section 10.3** above.

In summary, the description of the baseline environment is based on a series of baseline field surveys carried out in 2020 and surveys commissioned by Wicklow County Council and Irish Water for the Arklow FRS and the Arklow WwTP projects, a review of relevant mapping and reports by the NBDC and NPWS, and existing reports of the area including the County Wicklow Wetland Survey II (Wilson *et al*., 2012[18]).

The description of the baseline environment is also informed by the AA Screening report and NIS prepared for the proposed FRS development and the environmental documents prepared for the Arklow WwTP project[19].

10.4.2 Overview of Arklow Area/Avoca Catchment

The planning boundary comprises permanent works within the Avoca River channel at Arklow town, along the south bank (upstream and downstream of Arklow Bridge), along the north bank (upstream of Arklow Bridge and within Arklow Town Marsh pNHA. The planning boundary also includes lands will be required for temporary works during the construction such as site compounds. Refer to **Figure 10.1** which shows the location of the planning boundary.

The Avoca River drains a primarily upland catchment of some 650km^2. It enters the Irish Sea at Arklow via a short river estuary that is largely contained by existing sea and harbour walls. The Avoca River is formed by the joining of the Avonmore and Avonbeg rivers, which rise in the Wicklow Mountains. The Avonmore River flows from Lough Dan, just west of Roundwood, and flows in a generally south easterly direction for approximately 30km before meeting the Avonbeg River (which rises near Table Mountain at the top of Glenmalure Valley), just north of the village of Avoca, and becoming the Avoca River. Closer to Arklow, the Aughrim River and the Avoca River flow through steeply sloping wooded valleys and join at Woodenbridge. The valley sides, with both coniferous and deciduous woodlands, are included within the Avoca River Valley proposed Natural Heritage Area (pNHA) (Site Code 001748). The Avoca River flows through lower ground from Shelton Abbey towards the Irish Sea and forms a west - east corridor through Arklow town. Upstream of Arklow Bridge is Arklow Town Marsh pNHA (Site Code 001931).

[18] Wilson, F., Crushell, P. Curtis, T. & Foss, P.J. 2012. The County Wicklow Wetland Survey II. Report prepared for Wicklow County Council and The Heritage Council.

[19] Arklow Wastewater Treatment Plant Project Environmental Impact Assessment Report (Arup, 2018a) and Natura Impact Statement (Arup, 2018b) are available at https://www.water.ie/planning-sites/arklow-wastewater/environmental-documents/

This pNHA includes the Avoca River channel, and the wetland habitats that extend northwards from the bank of the river.

Due to the presence of a tidal node or amphidromic point in the part of the Irish Sea, tidal variations at Arklow are low and the predicted range is given as 0.73m during Spring tides. However, under storm surge events this is probably greater. The river is tidal to *ca* 0.5km upstream of the Arklow Bridge but again under storm surge events, this would be extended westwards. Low salinity sea water (< 5 practical salinity units) will penetrate the upper *ca* 10 cms of the river bed.

10.4.3 Protected Areas: European Sites

The proposed development does not lie within or adjacent to any European sites.

An *AA Screening report and NIS* have been prepared for the proposed development. Specifically, this report focuses on the potential effects of the proposed development on the European sites within the Natura 2000 network.

Sites, species and habitats protected under Directive 92/43/EEC (Habitats Directive) and Directive 2009/147/EC (Birds Directive) are referred to as Natura 2000 sites. Natura 2000 sites are also referred to as European sites. These terms are synonymous. European sites in Ireland that form part of the Natura 2000 network of protected sites comprise SACs designated due to their significant ecological importance for habitats and species protected under Annex I and Annex II respectively of the Habitats Directive, and SPAs designated for the protection of populations and habitats of bird species protected under the EU Birds Directive (Council Directive 2009/409/EEC). Features for which SACs and SPAs are designated are called Qualifying Interests (QIs) and Special Conservation Interests (SCIs) respectively. Collectively SCIs and QIs are referred to as conservation features.

The AA Screening report and NIS considers *in situ* and *ex situ* effect to conservation features of European sites (*i.e.* potential effects to conservation features within or away from European sites respectively).

The AA Screening and NIS report, and conclusions are summarised in **Section 10.4.3.1** and **Section 10.4.3.2** below.

10.4.3.1 AA Screening and NIS Summary

The European sites within 15km of the proposed development site as presented in **Figure 10.4** are:

- Buckroney – Brittas Dunes and Fen SAC (Site Code 000729) (4.9km north of development)
- Kilpatrick Sandhills SAC (Site Code 001742) (6.8km south)
- Slaney River Valley SAC (Site Code 000781) (13.3km west)
- Magharabeg Dunes SAC (Site Code 001766) (14.8km north)

The QIs of the SACs are listed in **Table 10.3**.

For the QIs, screening exercises were undertaken of the potential effects of the FRS development. The full screening exercises are presented in the AA Screening and NIS report. In summary, the screening exercises demonstrated that the potential effect of the FRS on the QI habitats and species could be screened out (discounted).

The AA screening also considered potential for effects to Otter *Lutra lutra* which listed as a QI for Wicklow Mountains SAC (Site Code 002122), which is located over 40km upstream of the FRS *via* the Avonmore, Avonbeg and Avoca rivers. A screening exercise undertaken demonstrated that the FRS would not result in potential *ex situ* effects to the QI of the SAC - effects could be screened out (discounted).

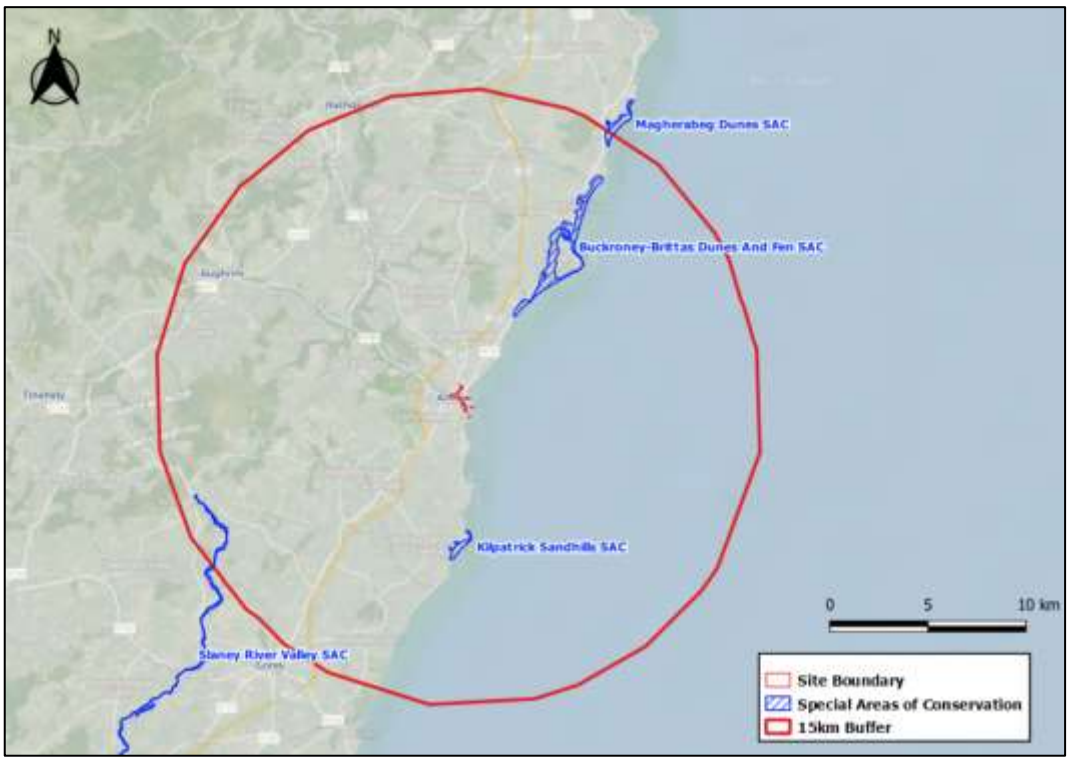


Figure 10.4: SACs within 15km of the proposed development

Table 10.3: QIs of SACs within 15km of the proposed FRS development

SAC	Qualifying Interests
Buckroney-Brittas Dunes and Fen SAC	Habitats
	1210 Annual vegetation of drift lines
	1220 Perennial vegetation of stony banks
	1410 Mediterranean salt meadows (Juncetalia maritimi)
	2110 Embryonic shifting dunes
	2120 Shifting dunes along the shoreline with Ammophila arenaria (white dunes)
	2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)*
	2150 Atlantic decalcified fixed dunes (Calluno-Ulicetea)*
	2170 Dunes with Salix repens ssp. argentea (Salicion arenariae)
	2190 Humid dune slacks
	7230 Alkaline fens
Kilpatrick Sandhills SAC	Habitats
	1210 Annual vegetation of drift lines
	2110 Embryonic shifting dunes
	2120 Shifting dunes along the shoreline with Ammophila arenaria (white dunes)
	2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)*
	2150 Atlantic decalcified fixed dunes (Calluno-Ulicetea)*
Slaney River Valley SAC	Habitats
	1130 Estuaries
	1140 Mudflats and sandflats not covered by seawater at low tide
	1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

SAC	Qualifying Interests
	1410 Mediterranean salt meadows (Juncetalia maritimi)
	3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
	91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles
	91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)*
	Species
	1365 Harbour Seal (Phoca vitulina)
	1355 Otter (Lutra lutra)
	1103 Twaite Shad (Alosa fallax fallax)
	1106 Salmon (Salmo salar)
	1099 River Lamprey (Lampetra fluviatilis)
	1029 Freshwater Pearl Mussel (Margaritifera margaritifera)
	1096 Brook Lamprey (Lampetra planeri)
	1095 Sea Lamprey (Petromyzon marinus)
Magherabeg Dunes SAC	1210 Annual vegetation of drift lines
	2110 Embryonic shifting dunes
	2120 Shifting dunes along the shoreline with Ammophila arenaria (white dunes)
	2130 Fixed coastal dunes with herbaceous vegetation (grey dunes)*
	2150 Atlantic decalcified fixed dunes (Calluno-Ulicetea)*
	7220 Petrifying springs with tufa formation (Cratoneurion)*

A total of 24 protected mobile SCI bird species designated for distant SPAs have been recorded in the vicinity of the proposed development area (see **Table 10.4**[20]). For the SCI species, screening exercises of potential effects were undertaken. The screening exercises considered the likelihood of species from the SPAs to occur in the Arklow FRS development area and thereby be affected by project impact mechanisms (*i.e.* potential for *ex-situ* effects).

The assessments of the likelihood of the species from their associated SPAs to occur in the development area are based on species ecology (habitat preferences, feeding guilds, typical diet, foraging behaviour *etc.*) and maximum recorded foraging ranges. Of the 24 SCI species, 7 SCI species were brought forward to the NIS for further assessment of *ex situ* effects due to the loss of marsh habitat and in-river habitat. The 7 SCI species and SPAs brought forward to the NIS are presented in **Table 10.5**. Site Synopsis Reports for the SPAs are presented in **Appendix 10.5**.

Following a comprehensive evaluation of the potential direct, indirect and cumulative impacts, it was concluded in the NIS that following the implementation of mitigation the development does not pose a **risk of significant adverse** *ex situ* effects to the SCIs.

Table 10.4: SCIs of distant SPAs

Special Conservation Interest Species
A053 Mallard (*Anas platyrhynchos*)
A052 Teal (*Anas crecca*)
A059 Pochard (*Aythya ferina*)
A061 Tufted Duck (*Aythya fuligula*)
A067 Goldeneye (*Bucephala clangula*)
A229 Kingfisher (*Alcedo atthis*)
A017 Cormorant (*Phalacrocorax carbo*)
A001 Red-throated Diver (*Gavia stellata*)
A160 Curlew (*Numenius arquata*)
A130 Oystercatcher (*Haematopus ostralegus*)
A140 Golden Plover (*Pluvialis apricaria*)
A137 Ringed Plover (*Charadrius hiaticula*)
A142 Lapwing (*Vanellus vanellus*)
A028 Grey Heron (*Ardea cinerea*)
A169 Turnstone (*Arenaria interpres*)

[20] Further detail of the SCI bird species listed in **Table 10.4** is included in **Section 10.4.6** below.

Special Conservation Interest Species
A125 Coot *(Fulica atra)*
A004 Little Grebe *(Tachybaptus ruficollis)*
A183 Lesser Black-backed Gull (*Larus fuscus*)
A184 Herring Gull (*Larus argentatus*)
A179 Black-headed Gull (*Chroicocephalus ridibundus*)
A182 Common (or Mew) Gull (*Larus canus*)
A050 Wigeon (*Anas penelope*)
A043 Greylag Goose (*Anser anser*)
A395 Greenland White-fronted Goose (*Anser albifrons flavirostris*)

Table 10.5: SCIs and associated SPAs brought forward to NIS

Special Conservation Interest Species	Site (Site code) (Distance to development)
A160 Curlew (*Numenius arquata*)	Wexford Harbour and Slobs SPA (004076) (44.6km)
A130 Oystercatcher (*Haematopus ostralegus*)	Wexford Harbour and Slobs SPA (004076) (44.6km)
A142 Lapwing (*Vanellus vanellus*)	Cahore Marshes SPA (004143) (27.1km)
A183 Lesser Black-backed Gull (*Larus fuscus*)	Poulaphouca Reservoir SPA (004063) (41.2km)
	Wexford Harbour and Slobs SPA (004076) (44.6km)
	Lambay Island SPA (004069) (75.9km)
	Saltee Islands SPA (004002) (78.2km)
	Ballymacoda Bay SPA (004023) (152.6km)
	Ballycotton Bay SPA (004022) (163.8km)
	Cork Harbour SPA (004030) (169.6km)
A184 Herring Gull (*Larus argentatus*)	Ireland's Eye SPA (004117) (66.4km)
	Saltee Islands SPA (004002) (78.2km)
	Skerries Islands SPA (004122) (85.4km)
A179 Black-headed Gull (*Chroicocephalus ridibundus*)	The Murrough SPA (004186) (21.3km)
A050 Wigeon (*Anas penelope*)	The Murrough SPA (004186) (21.3km)
	Cahore Marshes SPA (004143) (27.1km)
	Wexford Harbour and Slobs SPA (004076) (44.6km)
	Tacumshin Lake SPA (004092) (69.3km)

10.4.3.2 Conclusion of NIS

The conclusion of the NIS was that the proposed development does not pose a risk of adversely affecting (either directly or indirectly) the integrity any European site, either alone or in combination with other plans or projects, and there is no reasonable scientific doubt in relation to this conclusion. Further details are provided in the NIS.

10.4.4 Protected Areas: Proposed Natural Heritage Area

Upstream of Arklow Bridge is Arklow Town Marsh pNHA (Site Code 001931). This pNHA includes the Avoca River channel, and the wetland habitats that extend northwards from the bank of the river.

The NPWS site synopsis report for the Arklow Town Marsh pNHA is included in **Appendix 10.6**. The Avoca River enters the Irish Sea at Arklow via a short riverine estuary that is largely contained by existing man-made sea and harbour walls.

A section of the pNHA (Arklow Marsh, north bank of Avoca River and river channel upstream of Arklow Bridge) is located within the planning boundary of the proposed development (see **Figure 10.5)**.

The total area of the Arklow Town Marsh pNHA measures approximately 83.84ha and comprises part of the Avoca River and a large wetland area on the north bank (NPWS 2009[21] see **Appendix 10.6**).

Habitats, flora and fauna of Arklow Town Marsh pNHA are described in detail in the sections below.

There are also two other pNHAs close by, one just to the north of Arklow Town, Arklow Sand Dunes (Site Code 001746) and the second *ca* 3km to the south of Arklow Town, Arklow Rock – Askintinny (Site Code 001745). Due to a lack of connectivity between the Avoca River and these two sites, they cannot be impacted by the proposed flood relief scheme in Arklow.

[21] NPWS 2009. Site Synopsis Site Name: Arklow Town Marsh Site Code: 001931. https://www.npws.ie/protected-sites/nha

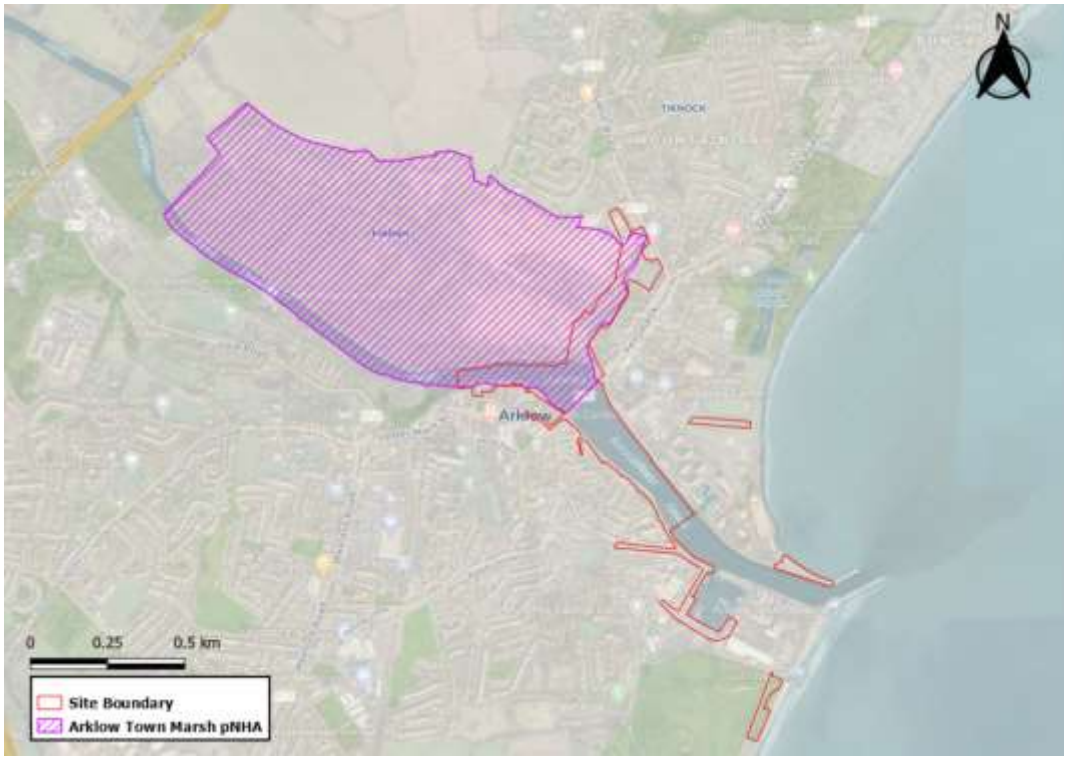


Figure 10.5: Arklow FRS planning boundary relative to the Arklow Town Marsh pNHA

10.4.5 Habitats and Flora

10.4.5.1 Overview

A series of walkover habitat surveys have been conducted for the Arklow FRS development and Arklow WwTP project (see **Section 10.3.3.1**) along River Walk along the south bank of the river upstream of the bridge, at Arklow Town Marsh pNHA and along on the north bank upstream of Arklow Bridge and along North Quay and South Bank (downstream of Arklow Bridge) and at Arklow Bridge.

Walkover surveys have also been carried out at the locations proposed for construction compounds (SC1-SC6), shown on **Figures 10.2** and **10.3.** The habitat types are listed in **Table 10.6** and shown in **Drawing No 001** below.

Table 10.6: Habitats (Refer also to Habitat Mapping on Drawing No 001)

Habitat (Fossitt classification)	River Walk & South Bank	North Quay (downstream of bridge)	Arklow Bridge	Arklow Town Marsh pNHA	SC1	SC2	SC3	SC4	SC5	SC6[22]
BC4 Flower beds and borders	✓	✓								
BL1 Stone walls and other stonework	✓	✓								
BL3 Buildings and artificial surfaces								✓		✓
CC1 Sea walls, piers and jetties									✓	
CW2 Tidal rivers/ FW2 Depositing lowland rivers [23]	✓	✓	✓	✓						
ED2 Spoil and bare ground	✓	✓								
ED3 Recolonising bare ground	✓	✓		✓						

[22] Moore's horsetail *Equisetum x moorei* initially identified at SC6. Boundary of SC6 was modified to avoid areas where *Equisetum x moorei* was previously recorded (see **Section 10.3.3.3** and **Appendix 10.1** for details).

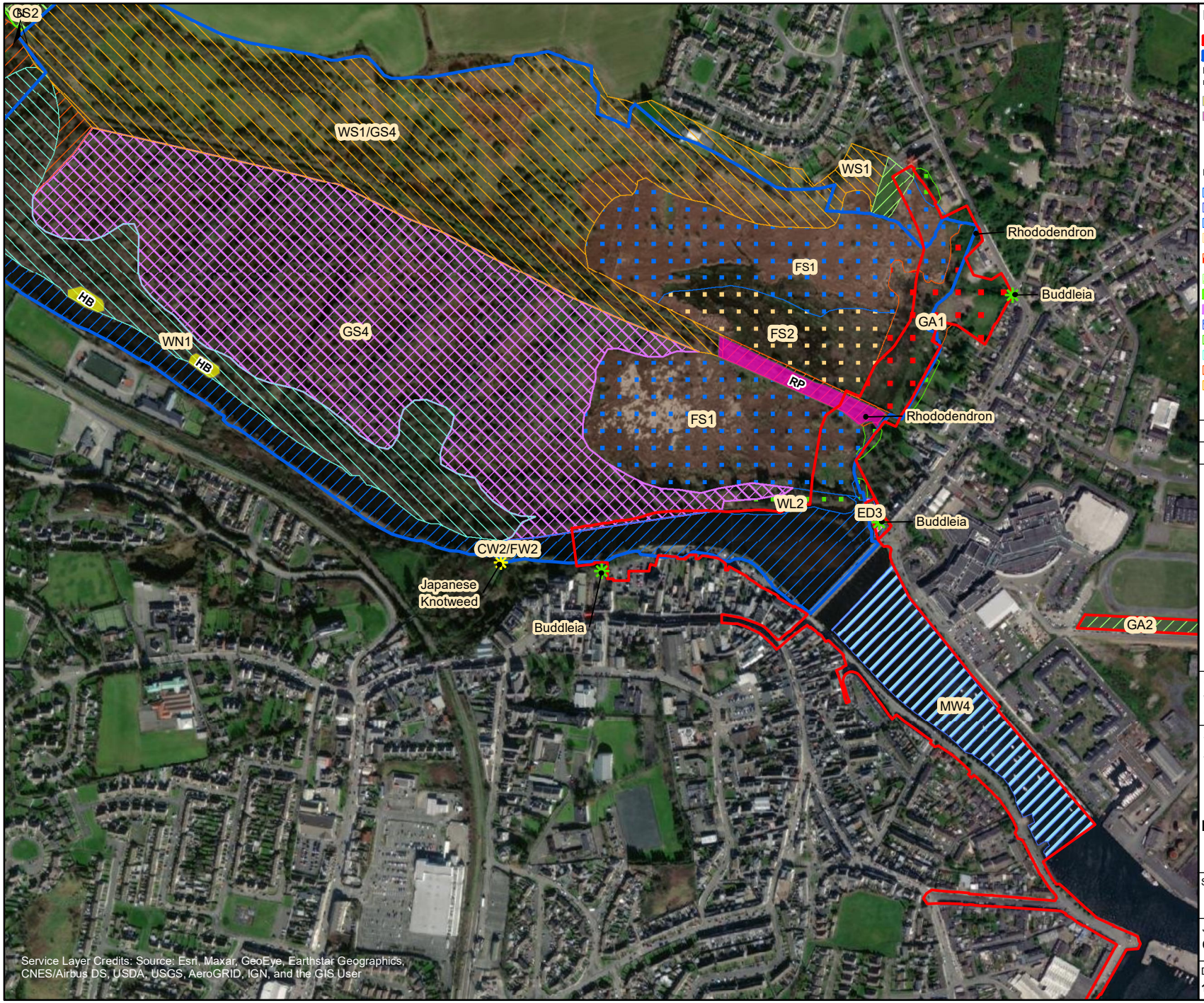
[23] Includes vegetated islands and gravel bank areas located immediately upstream of the Arklow Bridge.

Habitat (Fossitt classification)	River Walk & South Bank	North Quay (downstream of bridge)	Arklow Bridge	Arklow Town Marsh pNHA	SC1	SC2	SC3	SC4	SC5	SC6[22]
FS1 Reed and tall sedge swamp				✓						
FS2 Tall-herb swamp				✓						
FW4 Drainage ditches / FW3 Canals				✓						
GA1 Improved agricultural grassland / GS4 Wet grassland				✓	✓					
GA2 Amenity grassland	✓	✓				✓				✓
GM1 Marsh				✓						
GS4 Wet grassland				✓						
MW4 Estuaries	✓	✓	✓							
WL2 Treelines	✓	✓		✓						
WN1 Oak-birch-holly woodland				✓						
WS1 Scrub		✓		✓			✓			

Habitat (Fossitt classification)	River Walk & South Bank	North Quay (downstream of bridge)	Arklow Bridge	Arklow Town Marsh pNHA	SC1	SC2	SC3	SC4	SC5	SC6[22]
WS1 Scrub / GS4 Wet Grassland				✓						
WS3 Ornamental non-native shrub	✓	✓		✓						
RP Rhododendron (*Rhododendron ponticum*)				✓	✓					
HB Himalayan balsam (*Impatiens glandulifera*[24])				✓						
BD Butterfly-bush (*Buddleia davidii*)	✓				✓		✓			
JK Japanese Knotweed (*Fallopia japonica)*	✓									

[24] The invasive species Himalayan balsam is recorded at three locations adjacent to the Avoca River within the Arklow Town Marsh pNHA (see Drawing No 001). These areas are located approximately 500m, 800m and 900m north west of the Arklow FRS planning boundary.

A4



Legend

- Arklow FRS Boundary
- pNHA Boundary

Invasive Species (Approximate location, do not rescale)

- HB Himalayan Balsam
- RP Rhododendron ponticum
- Buddleia
- Japanese Knotweed

Habitat

- CW2 Tidal rivers/FW2 Depositing lowland rivers
- ED3 Recolonising bare ground
- FS1 Reed and tall sedge swamps
- FS2 Tall-herb swamps
- GA1 Improved agricultural grassland / GS4 Wet land
- GA2 Amenity grassland
- GS2 Dry meadows and grassy verges
- GS4 Wet grassland
- MW4
- WL2 Treelines
- WN1 Oak-birch-holly woodland
- WS1 Scrub
- WS1 Scrub / GS4 Wet Grassland

Issue	Date	By	Chkd	Appd
D2	2021-04-16	LM	LG	FP

Kilometers

0 0.075 0.15 0.3

ARUP

50 Ringsend Road
Dublin 4, D04 T6X0
Tel +353 (0)1 233 4455 Fax +353 (0)1 668 3169
www.arup.com

Client

Wicklow County Council
Office of Public Works

Job Title

Arklow Flood Relief Scheme

Habitat and Invasive Species Survey

Scale at A4

1:8,000

Job No	Drawing Status
605246-40	**Issue**

Drawing No	Issue
10.6	**I1**

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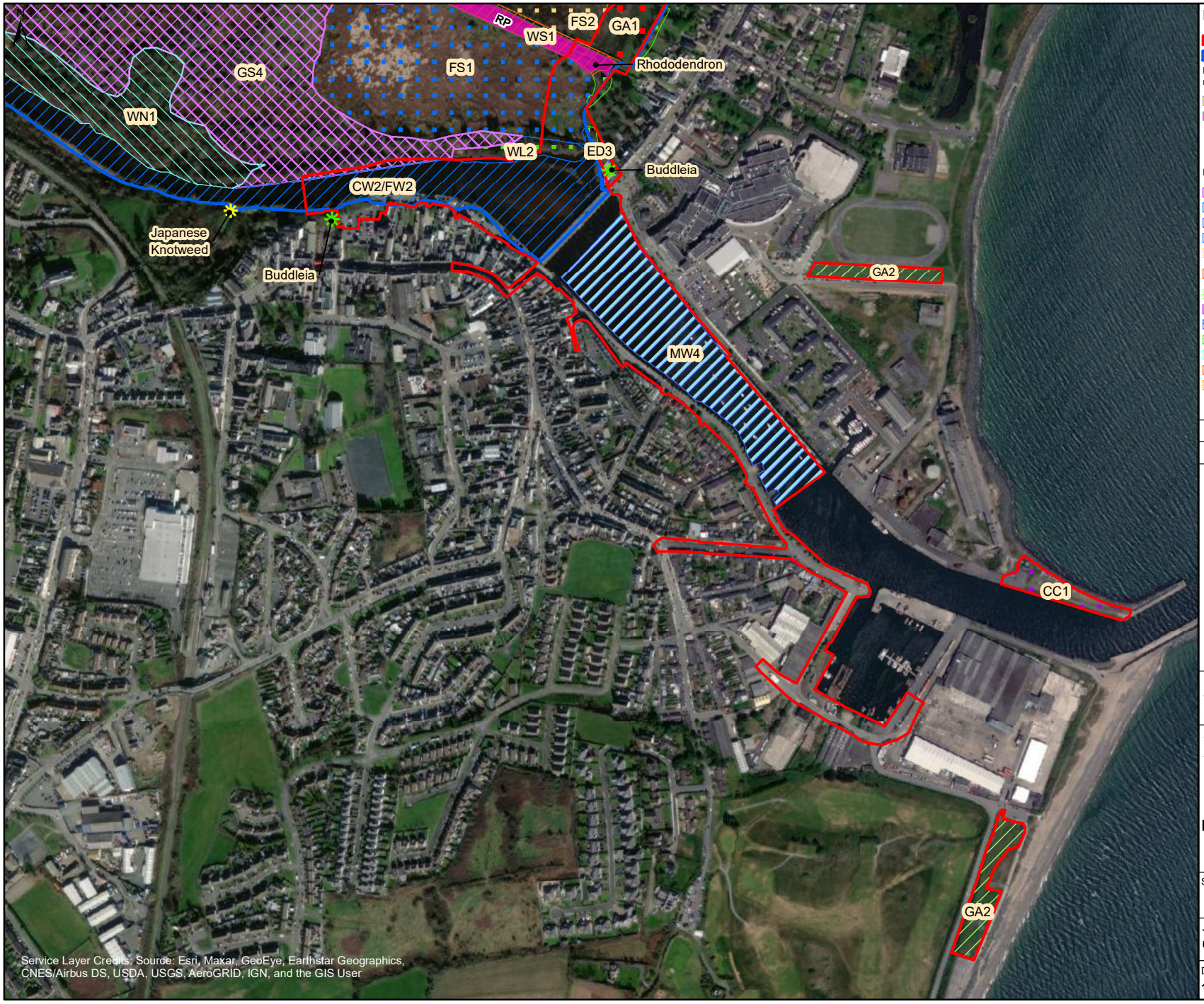
A4



Legend

- Arklow FRS Boundary
- pNHA Boundary

Invasive Species (Approximate location, do not rescale)

- HB Himalayan Balsam
- RP Rhododendron ponticum
- Buddleia
- Japanese Knotweed

Habitat

- CC1 Sea walls, piers and jetties
- CW2 Tidal rivers/FW2 Depositing lowland rivers
- ED3 Recolonising bare ground
- FS1 Reed and tall sedge swamps
- FS2 Tall-herb swamps
- GA1 Improved agricultural grassland / GS4 Wet land
- GA2 Amenity grassland
- GS4 Wet grassland
- MW4
- WL2 Treelines
- WN1 Oak-birch-holly woodland
- WS1 Scrub
- WS1 Scrub / GS4 Wet Grassland

Issue	Date	By	Chkd	Appd
D2	2021-04-16	LM	LG	FP

Kilometers

0 0.075 0.15 0.3

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Job Title

Arklow Flood Relief Scheme

Habitat and Invasive Species Survey

Scale at A4

1:8,000

Job No	Drawing Status
605246-40	**Issue**

Drawing No	Issue
10.7	**I1**

21/03/2018 11:12:09

10.4.5.2 Arklow Town Marsh pNHA including North Bank and River channel

Arklow Town Marsh pNHA is a relatively large marsh area that is located north of the Avoca River on the perimeter of Arklow Town and is described as a good example of a relatively large wetland. A disused roadway from Shelton Abbey bisects the site from east to west. They also include a disused railway line.

Habitats within the pNHA that are overlapped by the planning boundary area include:

- Tidal rivers (CW2)/ Depositing lowland rivers (FW2)
- Treelines (WL2)
- Improved agricultural grassland (GA1)/ Wet grassland (GS4)
- Reed and large sedge swamps (FS1)
- Recolonising bare ground (ED3)
- Scrub (WS1)/ Wet grassland (GS4)
- Drainage ditch (FW4) and Canals (FW3)
- *Rhododendron ponticum* (RP)

Habitats within the pNHA outside of the planning boundary include:

- FS2 Tall-herb swamps FS2
- Wet grassland (GS4)
- Oak-birch-holly woodland (WN1)

Part of compound SC1 is located in the northeast corner of the pNHA. Habitats within compound SC1 are characterised as improved agricultural grassland (GA1) / Wet grassland (GS4).

Compound SC3 is located in the southeast of the pNHA and borders the Avoca River. Habitats with SC3 are Scrub (WS1), Recolonising bare ground (ED3), and Tidal rivers (CW2)/ Depositing lowland rivers (FW2).

The invasive species Butterfly-bush (*Buddleia davidii*) and Rhododendron were recorded at SC1 while Butterfly-bush was recorded at SC3. Further details of habitats within SC1 and SC3 is included in **Section 10.4.5.6** below.

Immediately upstream of Arklow Bridge, the river area includes a number of vegetated islands and a gravel bank area. This river area and features lie within the FRS planning boundary (see **Figure 10.1**).

What follows is a description of flora found within the pNHA.

The pNHA is a good example of a relatively large wetland and is the principal wetland area in Arklow.

The marsh area is dominated by Common Reed (*Phragmites australis*), with Creeping Bent (*Agrostis stolonifera*) and Common Valerian (*Valeriana officinalis*) common in places.

On the southern side, numerous scattered bushes of willow (*Salix spp.*) are growing among Common Reed, forming a scrub in places. Drier areas are characterised by large tussocks of Tufted Hair-grass (*Deschampsia caespitosa*). Other plants present include Soft Rush (*Juncus effusus*), Yellow Iris (*Iris pseudacorus*), Skullcap (*Scutellaria galericulata*), Lesser Pond-sedge (*Carex acutiformis*) and several other sedges (*Carex spp.*).

Wet grassy areas with extensive stands of Water Horsetail (*Equisetum fluviatile*) occur on the north-east margin, with Creeping Bent, Common Spike-rush (*Eleocharis palustris*), Meadowsweet (*Filipendula ulmaria*) and rushes (*Juncus articulatus* and *J. conglomeratus*) present.

Extensive areas of the marsh are dominated by Reeds (*Phragmites australis*) (see **Figure 10.6** below), with Creeping Bent Grass (*Agrostis stolonifera*) and Valerian (*Valeriana officinalis*) common in places. Other plants present include Soft Rush (*Juncus effusus*), Iris (*Iris pseudacorus*), Skullcap (*Scutellaria galericulata*), Lesser Pond-sedge (*Carex acutiformis*) and several other sedges (*Carex spp.*). The dominant aquatic plants include Branched Bur-reed (*Sparganium erectum*), Fool's-water-cress (*Apium nodiflorum*) and Reed Canary-grass (*Phalaris arundinacea*).

Figure 10.6: Reed beds and *Convolvulus* in Arklow Marsh pNHA.

On the south side of the marsh along the edge of the Avoca River, the river bank is densely colonised by mature trees including Ash (*Fraxinus excelsior*), Alder *(Alnus glutinosus)*, Oak *(Quercus rober*), Pine (*Pinus sylvestris*), Sycamore (*Acer pseudoplantanus*), Birch (*Betula* spp.) and lower growing plants such as Gorse (*Ulex europaeus*), Hawthorn (*Crategus monogyna*), Holly (*Ilex aequifolium*), Ferns (*Pteridium aquilinium*), Bramble (*Rubus fruticosus*), Ivy (*Hedera helix*) and Reeds (*Phragmites australis*) (see **Figure 10.7** below).

Figure 10.7: Tree line along the north bank of the Avoca River.

There are also numerous scattered specimens of Willow (*Salix* spp.) growing among reeds that form a dense scrub in places.

Drier areas of the site are characterized by large tussocks of Tufted Hair Grass (*Deschampsia caespitosa*). There are other plants found at the site including: include Soft Rush (*Juncus effusus*), Iris (*Iris pseudacorus*), Skullcap (*Scutellaria galericulata*), Lesser Pond Sedge (*Carex acutiformis*) and several other Sedges (*Carex* spp.).

The site also contains improved and wet grassland areas with extensive stands of Bulrush (*Typha latifolia*) and Water Horsetail (*Equisetum fluviatile*) that occur on the northeast margin (see **Figure 10.8** below), with Creeping Bent Grass (*Agrostis stolonifera*), Spike Rush (*Eleocharis palustris*), Meadowsweet (*Filipendula ulmaria*) and Rushes (*Juncus articulatus* and *J. conglomeratus*), Bulrush (*Typha latifolia*) and Iris (*Iris pseudacorus*) are also present.

Figure 10.8: Improved and wet grassland areas in the north-eastern area of the marsh area.

The northern part of this improved wet grassland has been recently cleared (see **Figure 10.9**).

Figure 10.9: Cleared ground at Site Compound 1 behind the Petrol Station on the Dublin Road with Willow and Pine.

Garden escapes in the marsh include Rhododendron, Dogwood, Buddleia and Lawson's Cypress (see **Figure 10.10** below showing Rhododendron within the marsh and **Figure 10.11** showing Lawson's Cypress). Further description of invasive species recorded is included **Section 10.4.5.8** below.

Figure 10.10: Rhododendron within the Arklow Marsh pNHA viewed from avenue and looking north.

Figure 10.11: Lawson's Cypress on north bank of river within pNHA Arklow Marsh.

There have been recordings of Broad-leaved Cottongrass (*Eriophorum latifolium*) at the site but the NBDC website does not list the area for this species.

The Site Synopsis report for Arklow Town which was drafted in 1995, indicated that industrial air pollution was problematic in the Arklow area (NPWS 1995). At the time of writing the Site Synopsis, much of the willow at the site was defoliated. The effects of aerial pollution noted in the Site Synopsis are no longer apparent, with recovery and re-growth of willow within the marsh area and of trees on adjoining lands.

Existing impacts on the marsh include grazing and poaching by horses, periodic inundation by sea water during storm surge events, the presence of non-native garden escape plant species, historic impacts from both water and atmospheric pollution, infilling at its western end and historic drainage. Despite these impacts and its proximity to Arklow Town, it is a good example of a relatively large wetland.

10.4.5.3 River Walk

Habitats along this area and within the planning boundary include built areas, roads and foot paths (BL1 and BL3 *sensu* Fossitt), amenity grassland (GA2, *sensu* Fossitt, 2000), some planted mature trees *e.g.* Weeping Willow (*Salix babylonica*) and Sycamore (*Acer pseudoplantanus*) and tidal river/ lowland depositing river (CW2/FW2 *sensu* Fossitt, 2000). Refer also to **Table 10.1** and **Drawing No 001**. Japanese Knotweed (*Fallopia japonica*) and Buddleia were recorded along the River Walk area outside of the planning boundary.

Figure 10.12: Willow, Sycamore and Alder in the Riverbank area.

Figure 10.13: Habitats at the Riverbank location showing foot paths, roads, riverbank and trees. Feral geese, Mallard, Starling and Collard doves are also imaged.

10.4.5.4 South Bank

Habitats within the planning boundary along the western half of this area include built areas, roads and foot paths (BL1 and BL3 *sensu* Fossitt) and estuaries (MW4 *sensu* Fossitt, 2000) while the eastern half as far as the marina include built areas, roads and foot paths (BL1 and BL3 *sensu* Fossitt, estuaries (MW4 *sensu* Fossitt, 2000), amenity grassland planted with Sycamore, Cherry, Cordilines and Daffodils (GA2, *sensu* Fossitt, 2000) and sea walls (CC1 *sensu* Fossitt, 2000). No invasive species were recorded during walkover surveys in this location. Refer also to **Table 10.6** and **Drawing No 001**.

10.4.5.5 North Quay (downstream of bridge)

Habitats within the planning boundary on the North Quay (downstream of bridge) include estuaries (MW4 *sensu* Fossitt, 2000), buildings and artificial surfaces such as roads, footpaths (BL3 *sensu* Fossitt, 2000), a small marina and a works area for Arklow Harbour Commissioners at its eastern end (CC1 *sensu* Fossitt, 2000). Invasive species were not recorded during walkover surveys in this area. Refer also to **Table 10.6**.

10.4.5.6 Site Compounds

The location of the site compounds are shown on **Figures 10.2** and **10.3** above. Habitats listed with the site compounds are also listed in **Table 10.6** and shown

Site Compound 1

This Site Compound is located behind the Circle Garage on the south side of the Dublin Road (R772). Part of the compound is located in the northeast of Arklow Town Marsh pNHA. The habitat is improved agricultural grassland (GA1) / wet grassland (GS4) (*sensu* Fossitt, 2000) and a part of it has been recently stripped of plants. Mature trees include Scots Pine and Willow. It is grazed and poached by horses. The invasive species Butterfly-bush (*Buddleia davidii*) and Rhododendron were recorded at SC1.

Site Compound 2

This Site Compound is located near the Leisure Centre at Ferrybank. The habitat is amenity grassland (GA2 *sensu* Fossitt, 2000).

Site Compound 3

This Site Compound is located in the southeast of Arklow Town Marsh pNHA to the northwest of the roundabout on the north side of the Arklow River. The habitats present are scrub (WS1), and tidal river/ depositing lowland river (CW2/FW2*sensu* Fossitt, 2000). Species recorded in WS1 include Willow, Bramble, Buddleia, Apple and Ragwort.

Site Compound 4

This Site Compound is located on the south bank of the Avoca River and west of Arklow Bridge along River Walk. It is used for car parking (Main St car park) with no plant species present (BL3 *sensu* Fossitt, 2000).

Site Compound 5

This Site Compound is located at the eastern end of North Quay and is bounded to the south by the Avoca Estuary and to the north by the Irish Sea. It is used by Arklow Port as a storage area for port equipment. It falls under the definition of sea wall, piers and jetties (CC1 *sensu* Fossitt).

Site Compound 6

This is a narrow, triangular strip of grassland between South Beach and the Arklow Gold Club. It can be described as amenity grassland (GA2) *sensu* Fossitt, 2000). Curtis and Wilson (2007) recorded *Equisetum x moorei* in the area. In December 2020, AQUAFACT re-surveyed the area for this species but no *Equisetum x moorei* plants were recorded. AQUAFACT recorded *Equisetum telmateia* in the same area. Refer to **Appendix 10.1** for details. Following the December 2020 survey, the boundary of SC6 was reduced to avoid directly impacting on this area where *Equisetum x moorei* was recorded in 2007. Compound SC6 also comprised a car par (BL3 *sensu* Fossitt, 2000).

10.4.5.7 Bryophytes at Arklow Bridge

Denyer Ecology carried out a survey of bryophytes in the area around Arklow Bridge in November 2020. A total of 19 species was recorded and all were all mosses with no liverworts having been recorded. The full details of the survey are provided in **Appendix 10.7**.

Bryophyte diversity is relatively low for a large old stone bridge and lowland river in Ireland. Much of the stonework did not support bryophytes and it may be that either the bridge has been cleaned in the past or the stone is smooth and offers little hold potential for mosses. The top stonework of the bridge has been replaced with concrete and this was dominated by a few species typical of urban, calcareous, relatively smooth surfaces. There were few aquatic mosses, and this may be due to the tidal nature of the river in this location and slightly brackish water.

Four species were recorded from Arklow Bridge that have less than 10 records within Co. Wicklow (Vice County H20). These are *Didymodon nicholsonii, Leptodictyum riparium, Syntrichia laevipila* and *Syntrichia montana.* These are species of lowland urban or lowland river habitats, and all are widespread nationally and it is considered that they are under-recorded within Co. Wicklow, rather than genuinely rare. *Didymodon nicholsonii* was recorded upstream of the bridge; *Leptodictyum riparium* from both sides of the river downstream of the bridge and both *Syntrichia* species from side concrete at the very western end of the bridge, near the roundabout.

The main habitats for bryophytes within the survey area were the concrete on top of the bridge (above high tide level), stonework up and downstream of the bridge (at high tide level) and (to a lesser extent) the bridge stonework between high and low tide level (aquatic moss species). The bridge and adjacent habitats had relatively low bryophyte species diversity with a total of 19 mosses recorded.

None of these species are nationally rare or listed on the Flora (Protection) Order.

As noted above four species which have less than 10 records within County Wicklow were recorded. However, these are widespread and common species, which are likely to be under-recorded in Co. Wicklow. It is considered that the bridge does not support a bryophyte flora of conservation interest. However, it does support moderate to high bryophyte cover in some areas (*e.g.* the top concrete).

10.4.5.8 Invasive Alien Plant Species

Within the planning boundary two species of invasive plants have been recorded during walk-over surveys undertaken for the Arklow FRS development and Arklow WwTP project.

The species are Butterfly-bush (*Buddleia davidii*) and Rhododendron (*Rhododendron ponticum*). Butterfly-bush was recorded at SC1 and SC3. An extensive stand of Rhododendron was recorded in the eastern part of the pNHA and overlaps the planning boundary.

Outside of the planning boundary Himalayan balsam (*Impatiens glandulifera*) was recorded at three locations along the north bank of the Avoca River. Japanese Knotweed (*Fallopia japonica*) was also previously recorded, but its location was outside the planning boundary area.

The NBDC reports[25] the invasive plant species Japanese Knotweed (*Fallopia japonica*) and Rhododendron (*Rhododendron ponticum*) within reporting grid numbers T27G, T27H, T27L, T27M. The location of these records relative the Arklow FRS site boundary and Arklow Town pNHA boundary are shown in **Figure 10.14**.

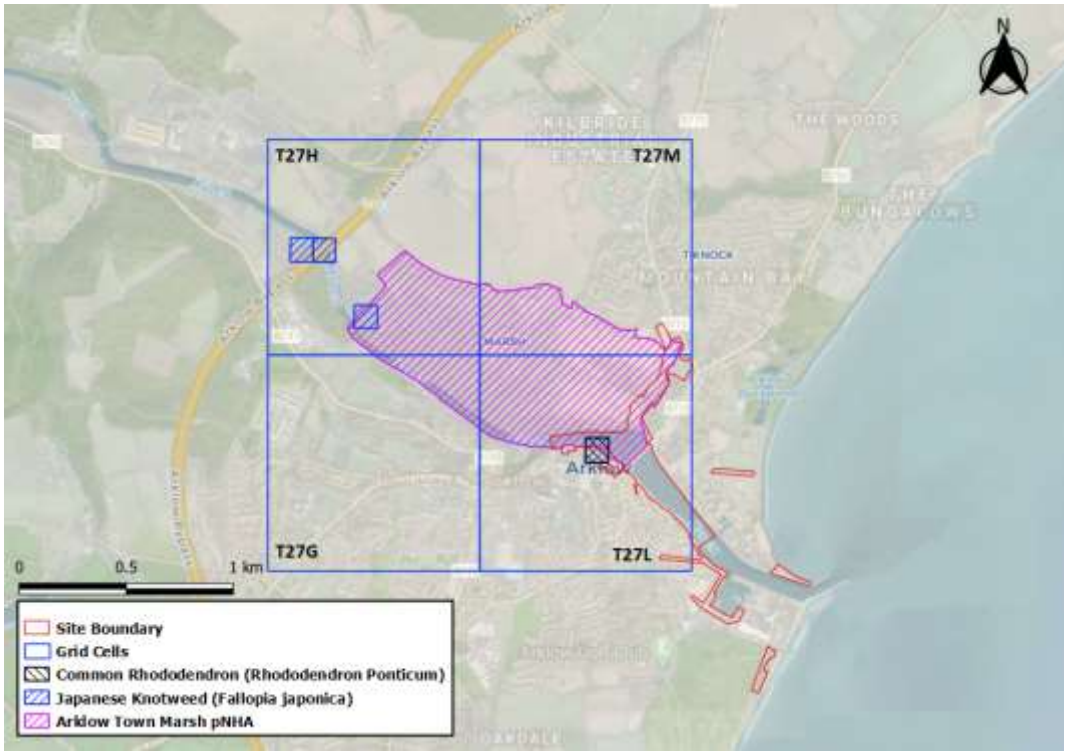

Figure 10.14: NBDC record of invasive species within grid squares T27G, T27H, T27L, and T27M, relative to Arklow FRS site boundary and Arklow Town pNHA

10.4.6 Birds

10.4.6.1 Bird Surveys at Arklow - 2016 – 2018

As part of the Arklow WwTP project, a series of 26 bird surveys were undertaken over 3 survey areas between September 2016 and February 2018 (Arup, 2018a, b). The survey areas were the Avoca River and Estuary, Arklow Pond, and nearby coastal waters. The surveys recorded a total of 22 waterbird species along the Avoca River and Estuary, at Arklow Pond, and in coastal waters, where one seabird species, Guillemot, was recorded.

[25] http://maps.biodiversityireland.ie (accessed 15/04/2021)

Gulls were the most numerous waterbirds and were recorded in all three survey areas (see **Table 10.7**).

Most of the gull use of the Avoca River and estuary was by birds roosting, bathing and preening; gulls use the gravel banks upstream of the Arklow Bridge to roost on, and bathe and preen in the fresh water of the river. Single Kingfishers, listed in Annex I of the Birds Directive, were recorded on three separate occasions, flying along the northern bank of the Avoca River upstream of Arklow Bridge. The riverbanks within the Arklow FRS planning area are not suitable for Kingfisher nesting as Kingfishers prefer vertical or near vertical banks at least 1-2m high[26].

House Sparrow, Starling, Magpie and Wood Pigeon were recorded as present along River Walk and South Bank, and as breeding in the general area. Grey Wagtail and Pied Wagtail were consistently present along the Avoca River banks and feeding on exposed gravels.

Breeding birds recorded include Meadow Pipit and Grey Wagtail, Red listed as breeding birds of Conservation Concern in Ireland, and Barn Swallow, Robin, Stonechat, Starling, House Sparrow and Linnet, which are Amber listed. With regard to Starling, Arklow Marsh is known to support a large roost for this species.

Of the species identified during the surveys, 17 species are listed as SCIs of Irish SPAs some of which are species for which neighbouring SPAs are designated. The 17 species are highlighted in bold text in **Table 10.4**.The stony gravel bank that exposes before the mid ebbing tide just upstream of the bridge is used as a roosting site by Herring Gulls, Black headed Gulls, Greater Black backed and Lesser Black backed Gulls and by Cormorant, Mute swan, Mallard, Heron and feral geese that are present in the estuary (see **Figure 10.15** below).

There are a number of tree stumps and low lying branches on the northern side of the river upstream of the bridge on which cormorant roost and downstream of the bridge, on the southern side of the river, there are a number of rocks that cormorant also use as perches (see **Figure 10.16** below).

[26] Cummins et al., 2010. Assessment of the distribution and abundance of Kingfisher *Alcedo atthis* and other riparian birds on six SAC river systems in Ireland. A report commissioned by the National Parks and Wildlife Service and prepared by BirdWatch Ireland.

Table 10.7: Peak numbers of waterbirds recorded during baseline surveys at Arklow. Special Conservation Interest species of Irish Special Protection Areas highlighted in bold

Species	Birds Directive Annex I	Birds Directive Annex II	Birds Directive Annex III	Special Conservation Interest species of Irish Special Protection Areas	Birds of Conservation Concern in Ireland (BoCCI)[27]. Breeding = b, wintering =w)	Shoreline and coastal waters[28]	Avoca River estuary	Arklow Pond[29]
Black Headed Gull (*Chroicocephalus ridibundus*)	-	Yes	-	Yes – 19 SPAs	Red (b)	67	512	101
Common or Mew Gull (*Larus canus*)	-	Yes	-	Yes – 21 SPAs	Amber (b)	21	50	-
Common Sandpiper (*Actitis hypoleucos*)	-	-	-	-	Amber (b)	-	1	-
Coot (*Fulica atra*)	-	Yes	Yes	Yes – 12 SPAs	Amber (b/w)	-	-	1
Cormorant *Phalacrocorax carbo*)	Yes	-	-	Yes – 22 SPAs	Amber (b/w)	13	9	-
Great Black-backed (Gull *Larus marinus*)	-	Yes	-	-	Amber (b)	4	40	-
Greenland White-fronted (Goose *Anser albifrons flavirostris*)	-	-	-	Yes – 29 SPAs	Amber (w)	-	1	1
Grey Heron *Ardea cinerea*)	-	-	-	Yes – 4 SPAs	-	-	3	-
Greylag Goose (feral) (*Anser anser*)	-	Yes	-	Yes – 8 SPAs	-	-	43	29
Black Guillemot (*Cepphus grylle*)	-	-	-	-	-	4	-	-
Herring Gull (*Larus argentatus*)	-	Yes	-	Yes – 18 SPAs	Red (b)	150	390	2
Kingfisher (*Alcedo atthis*)	Yes	-	-	Yes – 2 SPAs	Amber (b)	-	1	-

[27] Colhoun K. and Cummins, S. 2013 Birds of Conservation Concern in Ireland 2014-19. Irish Birds 9:523-544

[28] Shoreline and coastal waters lie outside of the FRS planning boundary. No impacts predicted.

[29] Arklow Pond lies outside of the FRS planning boundary. No impacts are predicted.

Species	Birds Directive Annex I	Birds Directive Annex II	Birds Directive Annex III	Special Conservation Interest species of Irish Special Protection Areas	Birds of Conservation Concern in Ireland (BoCCI)[27]. Breeding = b, wintering =w)	Shoreline and coastal waters[28]	Avoca River estuary	Arklow Pond[29]
Lesser Black-backed Gull (*Larus fuscus*)	-	Yes	-	Yes – 14 SPAs	Amber (b)	3	10	-
Little Grebe (*Tachybaptus ruficollis*)	-	-	-	Yes – 6 SPAs	Amber (b/w)	-	-	4
Mallard (*Anas platyrhynchos*)	-	Yes	Yes	Yes – 9 SPAs	-	-	49	51
Mediterranean Gull (*Larus melanocephalus*)	Yes	-	-	-	Amber (b)	3	-	-
Moorhen (*Gallinula chloropus*)	-	Yes	-	-	-	-	4	5
Mute Swan (*Cygnus olor*)	-	-	-	-	Amber (b/w)	-	2	6
Oystercatcher (*Haematopus ostralegus*)	-	Yes	-	Yes – 16 SPAs	Amber (b/w)	3	-	-
Red-throated Diver (*Gavia stellata*)	Yes	-	-	Yes – 6 SPAs	Amber (b)	1	-	-
Ringed Plover (*Charadrius hiaticula*)	-	-	-	Yes – 15 SPAs	-	1	-	-
Teal (*Anas crecca*)	-	Yes	Yes	Yes – 21 SPAs	Amber (b/w)	-	-	1
Turnstone (*Arenaria interpres*)	-	-	-	Yes – 11 SPAs	-	12	12	-

Figure 10.15: Exposed gravel bank with roosting gulls.

Figure 10.16: Perching cormorant east of the Arklow Bridge.

10.4.6.2 NBDC Bird Records

The planning boundary for the proposed FRS overlaps part of the Arklow Marsh pNHA (see **Figure 10.17**).

The Arklow Marsh pNHA lies within four NBDC 2km^2 reporting grid squares (T27G, T27H, T27L and T27M) (see **Figure 10.17**).

The NBDC reports[30] a total of 83 species of bird within T27G, T27H, T27L, T27M (see **Table 10.8**) of which 19 are listed as SCIs of Irish SPAs (see

Table 10.9).

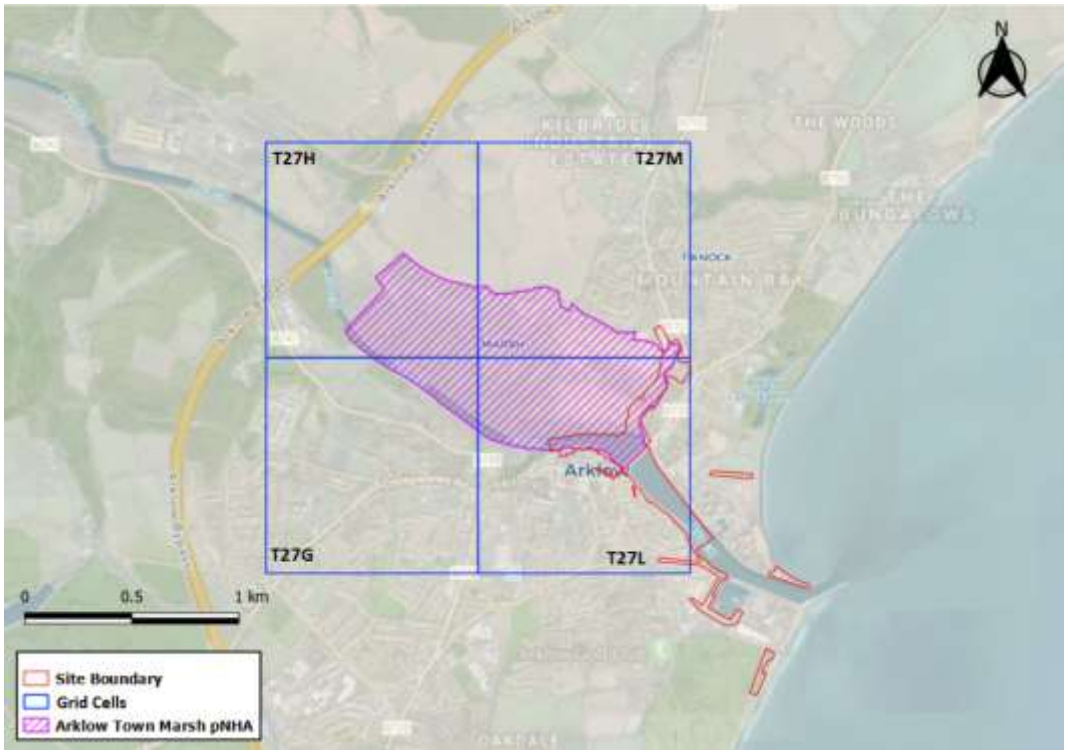

Figure 10.17: Planning boundary relative to grid squares T27G, T27H, T27L, and T27M and Arklow Town pNHA.

[30] http://maps.biodiversityireland.ie (accessed 15/04/2021)

Table 10.8: Bird species recorded with grid squares T27G, T27H, T27L, and T27M

Species – (Special Conservation Interest species of Irish Special Protection Areas highlighted in bold)		
Barn Swallow (*Hirundo rustica*)	Hedge Accentor (*Prunella modularis*)	Red Kite (*Milvus milvus*)
Black Kite (*Milvus migrans*)	**Herring Gull (*Larus argentatus*)**	Red-rumped Swallow (*Cecropis daurica*)
Black-billed Magpie (*Pica pica*)	Hooded Crow (*Corvus cornix*)	Reed Bunting (*Emberiza schoeniclus*)
Blackbird (*Turdus merula*)	House Martin (*Delichon urbicum*)	Reed Warbler (*Acrocephalus scirpaceus*)
Blackcap (*Sylvia atricapilla*)	House Sparrow (*Passer domesticus*)	Robin (*Erithacus rubecula*)
Black-headed Gull (*Larus ridibundus*)	Iceland Gull (*Larus glaucoides*)	Rook (*Corvus frugilegus*)
Blue Tit (*Cyanistes caeruleus*)	Jackdaw (*Corvus monedula*)	Rosy Starling (*Sturnus roseus*)
Bullfinch (*Pyrrhula pyrrhula*)	**Kingfisher (*Alcedo atthis*)**	Sand Martin (*Riparia riparia*)
Buzzard (*Buteo buteo*)	Laughing Gull (*Larus atricilla*)	Sedge Warbler (*Acrocephalus schoenobaenus*)
Chaffinch (*Fringilla coelebs*)	**Lesser Black-backed Gull (*Larus fuscus*)**	Siskin (*Carduelis spinus*)
Chiffchaff (*Phylloscopus collybita*)	Lesser Redpoll (*Carduelis cabaret*)	Sky Lark (*Alauda arvensis*)
Coal Tit (*Periparus ater*)	Lesser Whitethroat (*Sylvia curruca*)	Snipe (*Gallinago gallinago*)
Collared Dove (*Streptopelia decaocto*)	Linnet (*Carduelis cannabina*)	Song Thrush (*Turdus philomelos*)
Coot (*Fulica atra*)	Little Egret (*Egretta garzetta*)	Sparrowhawk (*Accipiter nisus*)
Curlew (*Numenius arquata*)	**Little Grebe (*Tachybaptus ruficollis*)**	Starling (*Sturnus vulgaris*)
Goldcrest (*Regulus regulus*)	Long-tailed Tit (*Aegithalos caudatus*)	Stonechat (*Saxicola torquata*)
Golden Oriole (*Oriolus oriolus*)	**Mallard (*Anas platyrhynchos*)**	Swift (*Apus apus*)
Golden Plover (*Pluvialis apricaria*)	Meadow Pipit (*Anthus pratensis*)	Treecreeper (*Certhia familiaris*)
Goldeneye (*Bucephala clangula*)	**Common (or Mew) Gull (*Larus canus*)**	**Tufted Duck (*Aythya fuligula*)**
Goldfinch (*Carduelis carduelis*)	Mistle Thrush (*Turdus viscivorus*)	Water Rail (*Rallus aquaticus*)

Species – (Special Conservation Interest species of Irish Special Protection Areas highlighted in bold)		
Grasshopper Warbler (*Locustella naevia*)	Montagu's Harrier (*Circus pygargus*)	White Wagtail (*Motacilla alba*)
Great Black-backed Gull (*Larus marinus*)	Moorhen (*Gallinula chloropus*)	Whitethroat (*Sylvia communis*)
Great Cormorant (*Phalacrocorax carbo*)	Mute Swan (*Cygnus olor*)	**Wigeon (*Anas penelope*)**
Great Spotted Woodpecker (*Dendrocopos major*)	**Northern Lapwing (*Vanellus vanellus*)**	Willow Warbler (*Phylloscopus trochilus*)
Great Tit (*Parus major*)	**Oystercatcher (*Haematopus ostralegus*)**	Winter Wren (*Troglodytes troglodytes*)
Greenfinch (*Carduelis chloris*)	Pheasant (*Phaisanus colchicus*)	Wood Pigeon (*Columba palumbus*)
Grey Heron (*Ardea cinerea*)	**Pochard (*Aythya ferina*)**	Woodcock (*Scolopax rusticola*)
Greylag Goose (*Anser anser*)	Raven (*Corvus corax*)	-

Table 10.9: SCI bird species recorded with grid squares T27G, T27H, T27L, and T27M

Species	Birds Directive Annex			Special Conservation Interest species of Irish Special Protection Areas	Birds of Conservation Concern in Ireland (BoCCI)[31]. Breeding = b, wintering =w)
	I	II	III		
Black Headed Gull (*Chroicocephalus ridibundus*)	-	Yes	-	Yes – 19 SPAs	Red (b)
Coot (*Fulica atra*)	-	Yes	Yes	Yes – 12 SPAs	Amber (b/w)
Curlew (*Numenius arquata*)	-	Yes	-	Yes – 19 SPAs	-
Golden Plover (*Pluvialis apricaria*)	Yes	Yes	Yes	Yes – 10 SPAs	-
Goldeneye (*Bucephala clangula*)	-	Yes	-	Yes – 6 SPAs	-
Cormorant (*Phalacrocorax carbo*)	Yes	Yes	-	Yes – 22 SPAs	Amber (b/w)
Grey Heron (*Ardea cinerea*)	-	-	-	Yes – 4 SPAs	-

[31] Colhoun K. and Cummins, S. 2013 Birds of Conservation Concern in Ireland 2014-19. Irish Birds 9:523-544

Species	Birds Directive Annex I	Birds Directive Annex II	Birds Directive Annex III	Special Conservation Interest species of Irish Special Protection Areas	Birds of Conservation Concern in Ireland (BoCCI)[31]. Breeding = b, wintering =w)
Greylag Goose (*Anser anser*)	-	Yes	-	Yes – 8 SPAs	-
Herring Gull (*Larus argentatus*)	-	Yes	-	Yes – 18 SPAs	Red 9b)
Kingfisher (*Alcedo atthis*)	Yes	-	-	Yes – 2 SPAs	Amber (b)
Lesser Black-backed Gull (*Larus fuscus*)	-	Yes	-	Yes – 14 SPAs	Amber (b)
Little Grebe (*Tachybaptus ruficollis*)	-	-	-	Yes – 6 SPAs	Amber (b/w)
Mallard (*Anas platyrhynchos*)	-	Yes	Yes	Yes – 9 SPAs	-
Common or Mew Gull (*Larus canus*)	-	Yes	-	Yes – 21 SPAs	Amber (b)
Northern Lapwing (*Vanellus vanellus*)	-	Yes	-	Yes – 23 SPAs	Amber (b/w)
Oystercatcher (*Haematopus ostralegus*)	-	Yes	-	Yes – 16 SPAs	Amber (b/w)
Pochard (*Aythya ferina*)	-	Yes	Yes	Yes – SPAs	Red (w)
Tufted Duck (*Aythya fuligula*)	-	Yes	Yes	Yes – 11 SPAs	Red (w)
Wigeon (*Anas penelope*)	-	Yes	Yes	Yes – 25 SPAs	Red (w)

10.4.6.3 Bird Survey at Arklow Town Marsh pNHA - 2017

The bird survey Arklow Town March pNHA comprised three early morning surveys carried out between April and May 2017. Birds present were recorded based on a combination of visual sightings and identification of calls. The results of the surveys are given in **Table 10.10**.

Table 10.10: Bird species recorded

Species	Breeding status[1]	Frequency in site[2]
Blackbird	Probable breeding	Frequent
Blackcap	Probable breeding	Occasional
Blue Tit	Probable breeding	Occasional
Chaffinch	Probable breeding	Occasional
Chiffchaff	Probable breeding	Occasional
Collared Dove	Probable breeding	Occasional
Dunnock	Probable breeding	Infrequent
Goldcrest	Probable breeding	Infrequent
Goldfinch	Probable breeding	Occasional
Great Tit	Probable breeding	Occasional
Grey Heron	Non-breeding	Occasional
House Sparrow	Probable breeding	Infrequent
Jackdaw	Probable breeding	Infrequent
Magpie	Probable breeding	Occasional
Mallard	Probable breeding	Occasional
Moorhen	Probable breeding	Occasional
Pheasant	Probable breeding	Occasional
Robin	Probable breeding	Occasional
Sedge Warbler	Probable breeding	Frequent
Snipe	Probable breeding	Occasional
Song Thrush	Probable breeding	Infrequent
Teal	Probable breeding	Infrequent
Willow Warbler	Probable breeding	Occasional
Woodpigeon	Probable breeding	Frequent
Wren	Probable breeding	Frequent
Starling	Probable breeding	Infrequent

1. Breeding status is based on the categories in the Bird Atlas 2007-11 (Balmer et al. 2013)

2. Frequency is based on the number of registrations recorded in all visits

10.4.7 Amphibians

The NBDC has records of the Common Frog (*Rana temporaria*) for within the Arklow Town area while records of Newt (*Lissotriton vulgaris*) are from *ca* 8km up river of the town. While Common Frog and Newt were not observed during the walkover survey, it is highly likely that the species are present in the area. In particular, vegetation and marsh habitats adjacent to the Avoca River and within the Arklow Town Marsh pNHA are likely to support these species. As the species are fairly widespread in Ireland and the potential for impact on both species is considered to be low, neither species are considered further.

10.4.8 Bats

Bat surveys undertaken in 2016 and 2017 as part of the Arklow WwTP project recorded four Habitats Directive Annex IV species bat species along the Arklow Bridge, Avoca River corridor, Arklow Town Marsh pNHA, and at Arklow Pond. The species recorded are:

- Common Pipistrelle (*Pipistrellus pipistrellus*)
- Soprano Pipistrelle (*Pipistrellus pygmaeus*)
- Leisler's Bat (*Nyctalus leisleri*)
- Daubenton's Bat (*Myotis daubentonii*)

In 2020 a bat survey undertaken to inform the application to NPWS for a bat derogation licence required for the proposed works at Arklow Bridge identified Daubenton's bat at the Bridge.

The full details of the surveys are provided in **Appendix 10.2** and **Appendix 10.3.** A summary of the survey results are provided below.

10.4.8.1 Bat roosts affected by the Arklow Flood Relief Scheme proposal

A roost site of Daubenton's bat (*Myotis daubentonii*) is located within Arklow Bridge arches.

Bats are using Arklow Bridge as a roost site (western side of the southern end of the bridge). This is likely to be most often individuals roosting rather than a maternity roost and it is a transitional roost.

On 17th November 2020, a single Daubenton's bat was noted resting on the wing wall of the older bridge section at the most southern arch of the bridge (closest to the town centre) close to the bridge expansion (western side of bridge) on November 17th, 2020. This bat was not seen to become active as it was not visible from the riverbank but signals on both detectors indicate that a Daubenton's bat flew past at approximately 10.20 hours. There was evidence gathered in August 2017 that bats were availing of crevices in the upriver side of the bridge (west) to roost at the southern end of the bridge. This was in the form of clusters and individual droppings below the crevices.

The northern end offers very suitable roosting conditions, but no bat signs or bats were present within this section either in 2017 or 2020.

10.4.8.2 Bat fauna feeding and commuting within and through the FRS site

Common pipistrelles were noted at all times throughout the survey period and throughout Arklow town. This is the most widespread species in Europe and is most often the most commonly encountered bat species. Common pipistrelles were widespread in Arklow in summer in 2016 and 2017. In October 2016, males of this species were noted calling along the riverbank south of the river. Common pipistrelles were also noted along the lands that would flank the proposed embankment, north of the river. This species was heard within the fields adjacent to Brigg's Lane behind Ferrybank around a derelict house and along the disused "railway line" (The marsh is traversed by an elevated pathway leading from the Dublin Road at Ferrybank to Shelton Abbey over 3.0km to the west and upstream of Ferrybank -reference in this section to the *railway line* is interpreted to be the *elevated pathway).*

Soprano pipistrelles were more numerous along the river and in marshy areas close to the river. This was the first bat to be noted around the mature trees along the river and one individual was present along the disused railway line for several minutes as well as feeding and calling around the derelict house.

Soprano pipistrelles were seen and heard along the southern riverbank west of Arklow Bridge and were the only species noted prior to dawn on 18th October 2016. Similarly, in August 2017, soprano pipistrelles were the most commonly encountered bat species prior to dawn.

The SM2 north of the river on 19th October 2016 revealed the presence of three species of bat; Leisler's bat, common and soprano pipistrelle. Each bat only occurred on one occasion between 18.15 hours and 21.30 hours.

Daubenton's bats were heard over several hours along the river and were also noted flying from the rear of the houses north of the river towards the river. Daubenton's bats were not roosting in any of the trees that will be removed by the proposed FRS embankment. Daubenton's bat activity was noted along the river from the Ferrybank Bridge to Arklow Castle and onwards to the M11 motorway bridge.

Ireland is considered to be a stronghold for Leisler's bats and this species is encountered throughout Leinster and the east coast. This bat fed throughout Arklow while moving to and from a roost site that was not within the FRS land take itself in June 2016.

The final bat observed prior to dawn was last noted flying towards the Avoca River in a south-westerly direction and it is probable that this individual was crossing towards the town over the river.

Leisler's bats were very briefly present on October 19th, 2016 at 19.31 hours and otherwise there was very little activity. This species was present in August 2017 but was less in evidence than all other species.

A Leisler's bat was seen and heard flying over the Main Road, Arklow close to the Castle ruins area prior to dawn away from any areas within the FRS scheme. The Castle ruins lies outside of the FRS planning boundary.

Common pipistrelle activity was the first noted at the ruins of Arklow Castle (19.08 hours) in the survey undertaken in October and this was followed 12 minutes later by soprano pipistrelle activity. Neither species was seen to return to Arklow Castle prior to dawn. However, on cold mornings, it is possible that bats have returned during the night and have not re-emerged to feed.

In August, no bats emerged or returned to the Castle. A number of bats were noted returning towards the town from the area west of Arklow Bridge prior to dawn but not to the Castle. Pipistrelle activity was noted heading to the southwest of the river. A Leisler's bat was noted flying to the south as discussed earlier in these results in the vicinity of the Castle (but clearly flying beyond the Castle). The roost that was present within the Castle would appear to be absent in August and October and given that the emergence area is more overgrown than when bats were present previously, it is probable that bats are either scarce or absent from the building.

Daubenton's bats were present close to water in almost all encounters with some Daubenton's bat activity in Arklow Marsh behind the houses at Ferrybank being the only exception.

Bat activity was predominantly soprano pipistrelle along the river with Daubenton's bat activity in various sections including at the northern end (west of the bridge) and up as far as the survey followed to the M11 bridge.

Common pipistrelle activity was present both west and east of the southern end of the bridge as well as along the river walk, west of Arklow Bridge towards Arklow Castle and up as far as the M11. Common pipistrelles were second to soprano pipistrelles in frequency of encounter.

Leisler's bats were noted on occasion throughout the site but were much less common than all other species.

Trees at the northern end of the town bridge offered low roost potential. Some of these had been removed by November 2020. Trees within the hedgerows north of this point have higher roost potential.

No roosts were noted in any of the trees examined prior to dawn and it was considered most probable from pre-dawn activity that bats were heading towards the houses at Ferrybank or further afield.

There is historic evidence of use of the Castle including information provided by the resident of the house adjacent to the Castle from childhood and up to recent years. The Castle ruins lie outside of the FRS planning boundary.

None of the bat boxes along the riverbank had been occupied by bats. These bat boxes were in clutter and ivy was blocking a number of the box entrances. A bat box at the Arklow Ponds was examined from ground level with a torch (not checked from a ladder) and no droppings or bat was visible.

Bat activity over the Arklow Ponds during an evaluation in 2017 was high and included Daubenton's bats, Leisler's bat, soprano and common pipistrelle. Several bat boxes around the Ponds are known to be in use (Enda Mullen, NPWS pers. Comm.). Ms Mullen provided the following additional information: there is a pipistrelle roost in a building near Arklow Bay Hotel (west of Arklow Pond), and another bat roost in the OPW building in Arklow town. The Arklow Ponds lie outside of the FRS planning boundary.

10.4.9 Other Terrestrial Mammals

Badger (Meles meles)

The NBDC data sets contains records of badger in the northern section of Arklow Town. Measures to mitigate potential construction impacts on are detailed in **Section 10.6.7**

Red Squirrel (Sciurus vulgaris), Grey squirrel (Sciurus carolinensis) and Pine marten (Martes martes)

With regard to Red squirrel (*Sciurus vulgaris*), though not observed during the course of the present survey, records held by the NBDC for the area come from 1984. More recently, Lawton et al. (2019) carried out an all-Ireland survey of red squirrel and also, Grey squirrel (*Sciurus carolinensis*) and Pine marten (*Martes martes*) and note that Nationally, records of Red squirrel have continued to increase since previous surveys in 2007 and 2012.

As neither Red Squirrel nor Pine Martin occur within the works area, no mitigation measures are neither required nor proposed.

Other terrestrial mammals likely to occur include Fox (*Vulpes vulpes)* Pygmy shrew (*Sorex minutes)* and the rodent species Wood Mouse (*Apodemus sylvaticus)*, House Mouse (*Mus domesticus)* and Brown Rat (*Rattus norvegicus)* are likely to occur. As all of these species are common throughout the area and no significant impact is considered likely on their populations, no mitigation measures are required.

10.4.10 Aquatic Ecology

10.4.10.1 General

The Avoca River continues to be one of the most seriously polluted rivers in Ireland due to acid mine drainage at Avoca Mines, just upstream of the village of Avoca[32]. This pollution has had, and continues to have, serious impacts on the macroinvertebrate and fish populations of the river.

[32] Fanning, A. Craig, M., Webster, P., Bradley, C., Tierney, D., Wilkes, R., Mannix, A., Treacy, P., Kelly, F., Geoghegan, R., Kent, T. and Mageean, M. (2017) Water Quality in Ireland 2010-2015. Environmental Protection Agency, Johnstown Castle, Co. Wexford

These impacts are most severe closest to the Avoca Mines site and are having a lesser effect downstream; an effect that appears to be diminishing over time[33].

The effects of the acid mine drainage from the Avoca Mines extends all the way to the estuary of the Avoca River. The Avoca River Estuary is the only transitional or coastal waterbody in Ireland to fail for chemical status under the Water Framework Directive (WFD) assessment due to the levels of substances that are not ubiquitous in the water environment[15].

In addition to the acid mine drainage impacting on the Avoca River for much of its length, the lack of a wastewater treatment plant for Arklow and its environs has resulted in untreated wastewater being discharged into the Avoca River Estuary. This is impacting water and sediment quality within the estuary.

10.4.10.2 Fish

Despite the negative impacts on the Avoca River from the acid mine drainage and the release of untreated wastewater, the river and estuary continue to support a diverse fish population.

Surveys of the Avoca River Estuary carried out under the WFD classed this waterbody as 'Moderate' status for the fish populations in both the 2008 and 2010 sampling periods (Kelly et al, 2009[34], Kelly et al, 2011[35]).

The Avoca River Estuary was classified as 'Good' status for fish populations in 2015 (Ryan et al, 2015). The overall WFD status of the Avoca Estuary for the period 2010 to 2015 is 'Moderate' (EPA data, Site Code IE_EA_150_0100). The Avoca River was classified by the Eastern River Basin District (ERBD 2008) as "Poor" in status partly on the basis of discharges from mines.

This "Poor" status is reflected in the low numbers of species and numbers of individuals of invertebrates that are present in estuarine and tidal river sediments as recorded above. These characteristics make it an unsuitable foraging area for fish.

The river and estuary provide a migration corridor for Habitats Directive Annex II listed diadromous fish species Atlantic Salmon *Salmo salar*, River Lamprey *Lampetra fluviatilis* and Sea Lamprey *Petromyzon marinus*.

[33] Gray, N.F. and Delaney, E. (2010) Measuring community response of benthic macroinvertebrates in an erosional river impacted by acid mine drainage by use of a simple model. Ecological Indicators 10: 668-675.

[34] Kelly, F., Harrison, A., Connor, L., Wightman, G., Matson, R., Morrissey, E., O'Callaghan, R., Feeney, R., Hanna, G., Lordan, M. and Rocks, K. (2009). Sampling Fish for the Water Framework Directive – Transitional Waters 2008. Avoca Estuary. The Central and Regional Fisheries Boards.

[35] Kelly, F., Harrison, A., Connor, L., Matson, R., Morrissey, E., O'Callaghan, R., Feeney, R., Wögerbauer, C., Hanna, G., Gallagher, K. and Rocks, K. (2011). Sampling Fish for the Water Framework Directive – Transitional Waters 2010. Avoca Estuary. Inland Fisheries Ireland.

The deep and slow flowing nature of the Avoca River immediately upstream, and the estuarine area within the Arklow FRS planning boundary do not provide suitable spawning habitat for salmon or lamprey species, which require shallower, faster flowing water over suitable spawning gravel (O'Reilly, 2009[36]). In addition, it should be noted that as result of the impact of both historical mining and the disposal of untreated sewage effluent on water quality and sediment chemistry and the tidal nature of the Avoca River upstream of the bridge, habitat quality of the lower reaches of the river makes the area unsuitable for fish egg laying/ development.

The closest SAC to the development area designated for these species is the Slaney River Valley SAC (Site Code 000781). There are no rivers connecting the SAC to the development area. By sea, the shortest distance of the SAC from the development area is over 50km.

O'Reilly (2009) notes that due to run-off from disused sulphur and copper mines, the water of the river is polluted. He does however mention that migratory fish hold up in the tidal waters before running up into the clear water above on a flood. He also comments that in the upper reaches in the Avonmore and Avonbeg, the rivers hold big stocks of small brown trout and also larger specimens of up to 2.5 kg noting that these bigger fish are probably seatrout.

The Central and Regional Fisheries Boards carried out a fish stock survey of the lower Avoca Estuary in 2008 (CFRB, 2009) and recorded the following 11 species of fish (with the number of specimens for each in brackets): River lamprey (5), Whiting (2), 3 spined stickleback (5), Salmon,(1), Sea trout (2), Brown trout (1), 5 bearded rockling (6), Sand goby (1), Eel (20), Spratt (1), Flounder (225) and Mullet (36).

Inland Fisheries Ireland (2012) carried out an electrofishing survey of a part of the upper Avoca River near Woodenbridge and recorded 6 juvenile salmon and eels at the site.

Inland Fisheries Ireland (2016) carried out a survey of River Lamprey between 2015 and 2016 in the upper reaches of the Avoca catchment in the Aughrim and Avonmore Rivers. A total 8 lamprey were trapped over that time period. River lamprey spawning sites were recorded at 3 locations and spawning was first noted in March 31st and continued in to mid – April.

The life cycle of the sea lamprey (*Petromyzon marinus*) contains both a marine phase and a freshwater phase.

Adult sea lamprey living as external parasites on host fish or marine mammals at sea grow in length from 60 to 100cm before migrating in spring into freshwater to excavate redds or spawning nests in gravelled areas of large rivers. Upriver migration occurs at a time of falling water levels and substantial spawning activity has been recorded in gravelled areas downstream of large weirs in the major Irish rivers.

[36] O'Reilly, P. (2009) Rivers of Ireland, a Flyfisher's Guide (7th Edition). Merlin Unwin Books, Shropshire, UK

Sea lamprey spawning has been recorded in the upper reaches of the Avoca River, where there are no barriers to upstream migration.

Egg laying follows nest excavation and the resulting larvae, called ammocoetes, hatch out within days. These swim or drift downstream to areas of fine sediment into which they can burrow. The ammocoete retains its burrowing habit in fine-grained sediment over a period of years. Transformation to the young adult stage occurs in late summer and the juvenile sea lamprey can be found migrating downriver to estuarine waters and the open sea in late autumn-winter. The sea lamprey is listed in the most recent Irish Red Data Book as Near Threatened. Barriers to upstream migration (*e.g.* weirs) are considered the major impediment to good conservation status for sea lamprey as these limit access to spawning beds and juvenile habitat. The Overall Status of this species is assessed as Bad with a stable trend, unchanged since the last 2013 assessment.

The sea lamprey which grows to maturity in the sea and migrates to freshwater to spawn. They migrate through the estuary from the sea in April and May (Hardisty, 1969) and spawn in rivers in late May or June and then return to sea.

The river lamprey (*Lampetra fluviatilis*) is a migratory species which grows to maturity in estuaries and migrates to freshwater to spawn from October to December (Maitland, 2003). Spawning occurs in the rivers in March and April. Between July and September young adults at 3-5 years of age migrate during darkness to the estuary. Salmon is a QI of the Slaney River Valley SAC. Salmon migrates through outer Wexford harbour into the Slaney River Valley SAC.

The river lamprey breeds in freshwater rivers and streams. Adults spawn in spring, excavating shallow nests in riverine sections comprising fine gravels and small stones. After hatching, the larvae or ‘ammocoetes’ drift or swim downstream to areas of river bed or margins with fine silt deposits.

They burrow into this bed material where they live as filter feeders over a period of years before transforming into young adult fish and migrating downriver to estuarine and marine habitats.

Following metamorphosis to adults, River Lamprey migrate to estuaries and the sea, where they spend one to two years feeding. As adults they are parasitic, attaching to and feeding on larger fish in coastal waters. They can grow up to 25-30cm at maturity, at which stage they return to freshwater habitats to spawn. The adult fish die after spawning. River and brook lamprey are indistinguishable as larvae. The mature adult forms are, however, clearly distinguishable based on body size. The two types of lamprey are considered by many in the same context as the brown trout / sea trout pairing, with a similar absence of genetic discriminators. The inability to distinguish between river lamprey and brook lamprey larvae, and the challenges associated with sampling for adult river lamprey, means that an evaluation of their actual range and population size cannot be undertaken.

The Overall Status for river lamprey is therefore assessed as Unknown. The previous reporting period used primarily juvenile Lampetra sp. distribution data for this species.

In Ireland, migration of adults back upstream for spawning takes place over a protracted period from late summer to autumn (Kelly & King, 2001[37]), while downstream movement of newly metamorphosed adults peaks in March-April (Hardisty et al., 1970[38]).

The Slaney is primarily a spring salmon fishery and is regarded as one of the top rivers in Ireland for early spring fishing (NPWS 2015). The upper Slaney and tributary headwaters are very important for spawning Smolts typically head out to sea between March and June and adults return to the river between March and August.

Atlantic salmon is indigenous to the North Atlantic. The Irish population generally comprises fish that usually spend two years as sub-adults in freshwater before going to sea as smolts. The majority of fish spend one winter at sea before returning to their natal rivers, mainly during the summer, as grilse. Smaller numbers spend two winters at sea, returning mainly in spring, hence "spring" salmon. A small proportion of the adult population returns to the sea post-spawning and can return to spawn again. The survival of salmon during the marine phase of its lifecycle has been identified as the key determinant of trends in population size in natal rivers. Known pressures include exploitation at sea in commercial fisheries, interceptory fisheries in coastal waters, aquaculture and predation. In addition, the negative influence of climate change on food prey structure and abundance has increasingly been attributed to the declines observed in stocks at sea. Within river systems, variation in individual stock abundance can be influenced by a variety of factors, notably alterations in physical habitat, water quality, environmental factors, predation, and angling and commercial fisheries exploitation pressure.

Salmon require passage through the estuary and lower reaches of the Avoca River and estuary to reach spawning grounds further up the system and the area may also support smolts and adults for a period of time on their way to sea or upriver, respectively. The Avoca River supports a spring and summer salmon run, with adults returning from sea, passing through the estuary and moving upstream during this period. Following hatching, salmon develop through a number of stages over the course of a number of years before undergoing physiological change (smoltification) to become smolts and be ready to go to sea.

[37] Kelly, F.L. and King, J.J. (2001) A review of the ecology and distribution of three lamprey species, *Lampetra fluviatilis* (L.), *Lampetra planeri* (Bloch) and *Petromyzon marinus* (L.): a context for conservation and biodiversity considerations in Ireland. Biology and Environment: Proceedings of the Royal Irish Academy 101B(3): 165 – 185.

[38] Hardisty, M.W., Potter, I.C. and Sturge, R. (1970) A comparison of the metamorphosing and macrophthalmia stages of the lampreys, *Lampetra fluviatilis* and *Lampetra planeri*. Journal of Zoology (London) 162: 383–400.

There are a range of factors that determine the exact timing of the movement of smolts to sea, including water temperature and photoperiod (McCormick et al., 1998[39], Byrne et al., 2004[40]); however, the seaward migration takes places over the spring to summer period.

European Eels also require passage through the lower reaches of the Avoca River on their migration from spawning grounds at sea to rivers where they spend most of their lives. Adult European Eels move to sea in the autumn[41], while glass eels (young eels migrating from the spawning grounds to rivers) move upstream in spring[42].

As noted above in the description of the estuary and in the tidal section of the Avoca and the impact of both historical mining and the disposal of untreated sewage effluent on sediment chemistry, habitat quality of the river bed makes it an unsuitable area for fish to lay eggs.

Marine fish in the coastal waters off Arklow include dogfish, ray, codling, whiting and tope, bass, dab, sole, flounder, plaice, sea trout and mackerel further south off Clogga. Commercial pot fishing by boats based in Arklow Harbour is mainly for whelk.

10.4.10.3 Marine mammals

Marine mammals listed on Annex II of the Habitats Directive generally occur in coastal and marine waters off Arklow.

The NBDC database includes a single sighting of Common Seal (*Phoca vitulina*) in the outer estuary in July 2016. Site investigation works have been carried out in the Avoca River estuary and in Arklow Bay to inform the Arklow WwTP project. As part of the work the contractor was required to appoint a qualified Marine Mammal Observer (MMO) to monitor for marine mammals and to log all relevant events during the intrusive ground investigations. A total of 30 MMO watches, with a total duration of 268 hours of observations, was carried out during the 30 minutes prior to, and during site investigation works[43]. During the watches no marine mammals were recorded.

[39] McCormick, S.D., Hansen, L.P., Quinn, T.P. and Saunders, R.L (1998) Movement, migration, and smolting of Atlantic salmon (*Salmo salar*). Canadian Journal of Fisheries and Aquatic Sciences 55(suppl. 1): 77-92.

[40] Byrne, C.J., Poole, R., Dillane, M., Rogan, G. and Whelan, K.F (2004) Temporal and environmental influences on the variation in sea trout (*Salmo trutta* L.) smolt migration in the Burrishoole system in the west of Ireland from 1971 to 2000. Fisheries Research 66(1): 85-94.

[41] Sandlund, O.T., Diserud, O.H., Poole, R., Bergesen, K., Dillane, M., Rogan, R., Durif, C., Thorstad, E.B., Asbjørn Vøllestad, L. (2017) Timing and pattern of annual silver eel migration in two European watersheds are determined by similar cues. Ecology and Evolution 7:5956–5966

[42] Anonymous (2008) National Report for Ireland on Eel Stock Recovery Plan Including River Basin District Eel Management Plans. Report prepared by the Inland Fisheries Division of The Department of Communications, Energy and Natural Resources, Dublin

[43] Guidance to Manage the Risk to Marine Mammals from Man-made Sound Sources in Irish Waters January 2014

In addition, as part of the Arklow WwTP project a series of 6 bird surveys of coastal waters were undertaken between Nov 2016 and Feb 2018. During these surveys, a single Common Seal was observed on one occasion.

The above clearly indicates that the Avoca River and Arklow FRS development area does not represent an important foraging area for the species.

10.4.10.4 Otter

Otter occur within the study area. During walkover survey undertaken as part of the Arklow WwTP project evidence of otter spraint was recorded at two locations along the south bank of the Avoca River between the M11 Bridge and the start of the built-up banks in Arklow Town upstream of the FRS planning boundary. It should be noted that it is likely that the vegetation at the banks of the Avoca River provide suitable habitat for the species, habitat surveys undertaken did not report evidence of otter holts, runs or slides in the area. The NBDC database includes a single sighting in 2015[44] of the Habitats Directive Annex II species Otter (*Lutra lutra*) in the Avoca River at Arklow Bridge. Two individuals (1 adult and 1 juvenile) were observed feeding along the southern bank in the early morning during the course of fieldwork carried out by AQUAFACT in summer of 2020.

Otter is a QI species of the Slaney River Valley SAC (Site code: 000781) which is located 13.3km as the 'crow-flies' west of the proposed development. There are no rivers connecting the SAC to the development area. Otter *Lutra lutra* is also listed as a QI for Wicklow Mountains SAC (Site Code 002122). This SAC is located over 40km upstream of the FRS *via* the Avonmore, Avonbeg and Avoca rivers. Given the location and distances of the SACs from the FRS area, it is highly unlikely that individuals from the sites would be found in the development area.

10.4.10.5 Marine and Freshwater Macroinvertebrates

The lower reaches of the Avoca River have been highly modified by human activity through the construction of retaining walls and harbour breakwaters. As noted above, river water quality has been impacted by acid mine drainage from the Avoca Mines upstream. The estuary is also influenced by the input of untreated sewage below the bridge. Because of these impacts, the intertidal and estuarine habitats of the study area are depressed in species numbers and this in turn decreases the species richness and therefore are of low ecological value.

Concerning marine invertebrates, a benthic survey of the lower part of the Avoca Estuary was carried out by AQUAFACT in August 2020 to document the conditions in terms of sediment quality and infauna present (see Figure 10.18 below for positions of the sampling sites).

https://www.npws.ie/sites/default/files/general/Underwater%20sound%20guidance_Jan%202014.pdf

[44] https://maps.biodiversityireland.ie/ (accessed 15/04/2021)

Duplicate faunal samples were taken at each location and positions were recorded using a hand held GPS device. A 0.025m² grab was deployed from an inflatable and on recovery, the sediment type, colour and smell was recorded, and the sample was placed for later washing through a 1mm mesh sieve and preserving in 5% formalin on land. The samples were returned to the laboratory for sorting, identification and enumeration of macrofauna under a microscope. Faunal returns for each sample at each site are presented in **Table 10.11** below. The examination of the sediments showed them all to be black, muddy sands with small amounts of shell and gravel and strongly smelling of hydrogen sulphide.

Figure 10.18: Location of 6 sampling sites in the Avoca Estuary, 13 August 2020.

Table 10.11: Taxa and number of specimens recorded in the lower Avoca Estuary

Station	Species		
St. 1a	*Tubificoides benedii* 5	*Capitella capitata* 2	*Owenia fusiformis* 1
St.1b	*Tubificoides benedii* 7	*Capitella capitata* 1	*Hediste diversicolor* 2
St.2a	*Tubificoides benedii* 4 *T. pseudogaster* 2	*Capitella capitata* 3	*Amphictene auricoma* 1
St. 2b	*Tubificoides benedii* 2	*Capitella capitata* 5	
St. 3a	*Tubificoides benedii* 9	*Capitella capitata* 4	
St. 3b	*Tubificoides benedii* 6 *T. pseudogaster* 3	*Capitella capitata* 1	*Nepthys hombergii* 1
St. 4a	*Tubificoides benedii* 12	*Capitella capitata* 6	*Hediste diversicolor* 3

Station	Species		
St. 4b	*Tubificoides benedii* 3		
St. 5a		*Capitella capitata* 1	
St. 5b	*Tubificoides benedii* 3	*Capitella capitata* 2	
St. 6a	No fauna		
St. 6b	No fauna		

The marine benthic community immediately outside the Avoca Estuary in the Irish Sea has a depressed species richness compared to what might be expected from the habitat present. It is likely that the discharge of untreated wastewater and acid mine drainage to the Avoca River is having an influence in terms of contaminant load, as suggested in previous benthic surveys by BEC in 2017. The area is dominated by a single biotope *Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment. This biotope is common and widespread along the east coast of Ireland.

With regard to assessing water quality in the Avoca River, the standard method is known as the Q index. In aquatic systems, as levels of pollution increase, so invertebrates react to this variable. Taxa are either highly intolerant, moderately tolerant or very tolerant to different levels of pollution and those that fall into the highly intolerant group *e.g.* many May flies and Stone flies, are never found in even moderately polluted water while highly tolerant taxa include such groups as tubificid oligochaetes, asellids and *Chironomus* sp.

By taking a sample of the benthic invertebrates and identifying the biological material even to as high a taxonomic level of family, from these results, it is possible to determine the likely quality of the water in terms of pollution. This is known as the Biological River Quality Classification System or Q value (Q-Scheme) and it has been in use in Ireland since 1971. It has undergone a number of modifications since then and has been included in the Local Government (Water Pollution) Act, 1977 (Water Quality Standards for Phosphorus) Regulations, 1998. It is routinely employed by the EPA. For the purpose of this assessment benthic invertebrates have been divided into five indicator groups according to tolerance of pollution, particularly organic pollution.

In order to determine the biological quality of the river, the Q-scheme index is used whereby the analyst assigns a Biotic Index value (Q-Value) based on the results of the identification and enumeration of macroinvertebrate samples collected in different parts of the aquatic system. The Biotic Index is a quality measurement for freshwater bodies that range from Q1 – Q5 with Q1 being of poorest quality and Q5 being pristine/unpolluted (see **Table 10.12** below).

Table 10.12: Biotic Index scoring system for the Q-Scheme (Lucey *et al.*, 1999)

Biotic Index	Quality Status	Quality Class
Q5, 4-5, 4	Unpolluted	Class A

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

With regard to Q values of the Avoca River, the ERU (1992) record very low values of 1 – 0 at Arklow Bridge for 1986 and 1990 indicating a quality status of Seriously Polluted. The most recent review (EPA 2020) noted that the lack of pollution sensitive taxa and the low abundances of pollution tolerant species continued to indicate significant ecological disruption at Avoca Bridge in July 2019.

As noted previously, the freshwater macroinvertebrate community of the Avoca River was sampled at six locations on the main channel and at one location (S7), close to the M11 Bridge on the channel that runs in a south-easterly direction through Arklow Town Marsh by BEC on 26 September 2017. The survey was carried out by BEC to inform both the FRS and WwTP. Two of the locations (S1, S2) were situated within the planning boundary of the FRS. S1 was located just downstream of Arklow Bridge. S2 was located upstream of Arklow Bridge. The remaining five locations were situated further upstream.

At S1 which is located just downstream of Arklow Bridge shows the estuarine influence on the macroinvertebrate community with a high abundance of the shrimp *Gammarus chevreuxi*, while the high numbers of the worm *Lumbriculus variegatus* present at this site point towards issues of organic pollution. This site also had the lowest species richness, with eight species or higher taxa recorded.

At S2, which is located approximately 250m upstream of the Arklow Bridge, a single *G. chevreuxi* individual was recorded, possibly reflecting the decreasing estuarine influence.

The community at S2 also included two crustacean species typically associated with freshwater environments, *Crangonyx pseudogracilis* and *Asellus aquaticus.* The relative abundance of these species at the sampled site increased with increasing distance upstream.

Conversely, (S6), the most upstream site on the Avoca River upstream of the M11 Bridge had higher species richness with 21 species or higher taxa recorded. Fauna of the channel that flows through Arklow Town Marsh (S7), was dominated by mollusc species including *Radix peregra* and *Physa fontinalis*. This reflects the very slow-flowing or still nature of the water at this site.

There are no records of the protected White-clawed Crayfish (*Austropotamobius pallipes*) from the Avoca River catchment, due to the low pH and alkalinity conditions created by the underlying geology[45].

Three Margaritifera Sensitive Areas lie upstream of the proposed FRS:

- Avoca - Aughrim; catchment of extant population;
- Avoca – Upper Avonmore; catchment of extant population; and
- Avoca – Lower Avonmore; catchments with previous records of Margaritifera, but current status unknown.

The Freshwater Pearl Mussel *Margaritifera margaritifera* is listed in Annex II of the Habitats Directive and has been recorded in the Aughrim and Avonmore tributaries as noted above, but not in the Avoca River.

10.4.10.6 Conclusion on Aquatic Ecology

The freshwater, estuarine and marine ecology in the vicinity of the proposed development has been described through field survey and desk study. The river has been impacted by acid mine drainage from the Avoca Mines upstream and the estuary also influenced by the input of untreated wastewater. The Avoca River Estuary is the only transitional or coastal waterbody in Ireland to fail for chemical status under the Water Framework Directive (WFD) assessment due to the levels of substances that are not ubiquitous in the water environment[46].

Despite the negative impacts on the Avoca River from the acid mine drainage and the release of untreated wastewater, the river and estuary continue to support a diverse fish population.

The river and estuary provide a migration corridor for Habitats Directive Annex II listed diadromous fish species Atlantic Salmon *Salmo salar*, River Lamprey *Lampetra fluviatilis* and Sea Lamprey *Petromyzon marinus*.

The deep and slow flowing nature of the Avoca River immediately upstream, and the estuarine area within the Arklow FRS planning boundary do not provide suitable spawning habitat for salmon or lamprey species, which require shallower, faster flowing water over suitable spawning gravel.

Otters occur within the study area and are likely to make use of both banks of the river.

The Avoca River does not represent an important foraging area for seal species.

The species richness of the macroinvertebrate community is somewhat reduced compared to what might be expected in a river such as the Avoca.

[45] Lucey, J. and McGarrigle, M.L. (1987) The distribution of the crayfish *Austropotamobius pallipes* (Lereboullet) in Ireland. Irish Fisheries Investigations Series A (Freshwater). No. 29.

[46] Fanning, A. Craig, M., Webster, P., Bradley, C., Tierney, D., Wilkes, R., Mannix, A., Treacy, P., Kelly, F., Geoghegan, R., Kent, T. and Mageean, M. (2017) Water Quality in Ireland 2010-2015. Environmental Protection Agency, Johnstown Castle, Co. Wexford.

This is due to the fact that the Avoca River is still recovering from the effects of acid mine drainage, which continues to have an influence on water quality. No rare or protected macroinvertebrates were recorded in the course of the surveys or desk study.

The low salinity of the estuary would likely play a factor in the low species richness and abundance, but the pollution caused by metals washed down from the Avoca mines upstream and the input of untreated wastewater into the estuary from Arklow Town are likely to be combining to cause the depauperate character of the benthic community in the Avoca River estuary, with the effect extending out to sea.

10.5 Likely Significant Effects

10.5.1 Do-Nothing Scenario

If the proposed flood relief scheme were not carried out, the habitats, flora and fauna would remain the same as reported above.

10.5.2 Impact Assessment Methodology

A detailed description of the proposed development is provided in **Chapter 4**.

In summary, the proposed development will involve the construction of flood defences and an embankment, as well as conveyance improvements in the Avoca River; including deepening of the river channel, the introduction of new debris and gravel traps and strengthening works to the existing quay walls and Arklow Bridge. The altered channel profile along with the provision of a gravel trap upstream of Arklow Bridge will reduce significantly the level of maintenance required for the river channel. It is expected however that there will be some level of sediment settling along the channel related to the flood scheme. As such, some dredging of the channel will be required from time to time (approximately once every 10 years). This will follow a similar methodology as the channel dredging and will be dependent on where deposition occurs. This is estimated as every ten years but will be based on periodic surveys of the riverbed levels.

Wicklow County Council considers Arklow FRS to be a key strategic asset in the protection of Arklow Town from flooding and it will have a minimum of a 50 year design life. As such it is anticipated that the proposed development will be maintained by Wicklow County Council in the long term. In the event of decommissioning, measures will be undertaken by Wicklow County Council to ensure that there will be no likely significant effects associated with the decommissioning of the proposed development.

The potential impact mechanisms (sources of impact) of concern with regard to effects to biological receptors of the environment are associated with the activities proposed for the construction and operational phases of the development.

The assessment of likely significant direct and indirect effects of impact mechanisms on biodiversity (plants, animals, and habitats) within the zone of influence of the project (*in situ* effects).

As well as considering potential *in situ* effects to biodiversity, consideration has been given to potential effect to highly mobile protected conservation features species of more distant European sites that may occur in the development area and thereby be affected (*ex situ* effects to European sites).

10.5.3 Impact Mechanisms

The impact mechanisms associated with the development, which have been identified based on the location, nature and scale of the activities proposed for the construction and operation phases, take into account the sensitivities of the biological receptors recorded in the project area.

10.5.3.1 Impact Mechanism 1 Discharges

As with any construction activity there is a risk potential that activities proposed for construction and operational phases of the development (including construction, excavation work, capital dredging and occasional channel dredging operations, installation of permanent river side ramps, installation/ removal of temporary river access points, haul roads and causeways, maintenance of debris and gravel traps) may result in the release of sediments to to nearby habitats and watercourses including the river. There is also potential that water quality may be affected by the accidental release of concrete materials.

There is risk that activities associated with the construction phase may result in the accidental release of chemicals or other waste material pollution. Potential pollutants associated with construction plant equipment include fuels, oils, greases hydraulic fluids (hydrocarbons).

As noted in Section 5.5.2 of **Chapter 5** *Construction Activities*, a dredge material management study has been undertaken, the results of which are presented in **Appendix 15.2** of the EIAR.

The results of the study as presented in **Table 5.5** of **Chapter 5** *Construction Activities*, indicate that bulk of the proposed dredge material (estuarine material) will comprise of inert natural sands and gravels, with a small proportion of the dredge material comprising of a surface layer of fill (silty riverbed with fill material containing anthropogenic material). The natural sands and gravels will be suitable for reuse within the scheme and/or offsite. The fill material was identified on the south bank upstream of Arklow Bridge. Some of this fill material will require disposal to a hazardous licenced facility and the remainder of the fill material will require disposal to a non-hazardous licenced landfill. Some of the dredged material sampled downstream of Arklow Bridge had natural slightly elevated chloride concentrations, likely due to saline intrusion given the tidal influence on this section of river. Temporary stockpiling of this material is likely to allow natural reduction in chloride concentrations sufficiently so this material could be deemed to be inert (subject to verification testing).

At noted in **Table 5.5** of **Chapter 5** *Construction Activities*, some of the dredge material excavated will require archaeological examination at the site compounds prior to removal offsite. Inert dredge (sands and gravels) will be archaeologically examined at SC1 and SC6.

Material with slightly elevated chloride concentrations will be archaeologically examined at SC1 and reused for construction of the embankment. Material with slightly elevated chloride concentrations will also be archaeologically examined at SC5 before removal offsite. Hazardous and non-hazardous contaminated material will be archaeologically examined at SC2 before removal offsite.

In the absence of mitigation measures, there is a potential risk of discharges into the river during the excavation of the contaminated fill material on the south bank upstream of Arklow Bridge. There is a potential risk of discharges into the ground

In the absence of mitigation measures, there is potential that runoff from the stockpiles of excavated dredge material at the site compounds may result in the introduction of sediment and, hazardous and non-hazardous contaminants and slightly elevated chloride concentrations to the adjacent habitats, marsh and river, potentially impacting habitat and water quality. Following construction of the embankment adjacent to the marsh, it is likely that runoff from the dredge with the slightly elevated chloride concentrations will percolate into the ground.

During bridge masonry repair works, plant roots attached to the bridge will be treated using herbicide; accidental release of herbicides to the river may impact water quality. Water quality may also be affected by the accidental release of concrete and grouting materials.

An assessment of potential effects associated with discharges is presented in **Section 10.5.4.1**. Relevant measures necessary to avoid the risk of impact associated with discharges are referenced in **Section 10.6**.

10.5.3.2 Impact Mechanism 2 Loss of in-river habitat

Elements that will result in loss of in-river habitat include the construction of river access points, temporary causeways, the installation of the debris and gravel traps and riprap within the river channel, in-stream capital dredging including the removal of the in-stream vegetated islands and gravel bank located upstream of the Arklow bridge, occasional channel dredging (during maintenance), installation and removal of temporary in-stream access ramps to allow access to and maintenance of debris and gravel traps (**Figure 10.14**). The construction of flood walls along River Walk, South Quay and around the dock on the south (right) bank, will result in in-river habitat loss at two locations, one upstream and one downstream of the Bridge.

An assessment of potential effects associated with loss of habitat is presented in **Section 10.5.4.1**. Relevant measures necessary to avoid the risk of impact associated with loss of habitat are detailed in **Section 10.6**.

10.5.3.3 Impact Mechanism 3 Noise disturbance

Construction activity including the construction and demolition works, piling operations, capital dredging and occasional channel dredging (during maintenance) and, the installation and removal of temporary in-stream access ramps for debris and gravel trap maintenance will result in noise emissions with potential disturbance to fish species.

An assessment of potential effects associated with noise disturbance is presented in **Section 10.5.4.3**.

10.5.3.4 Impact Mechanism 4 Loss of Terrestrial Habitat

Elements of the development that will result in the loss of habitats and vegetation of the Arklow Town Marsh pNHA are the construction of the flood wall along the north bank immediately upstream of the Arklow Bridge and the installation of the embankment at the marsh area. The location of the embankment is shown in drawings 1033 and 1032 presented in **Appendix 4.1.**

Works at SC1 and SC3, and the installation of the embankment will result in the loss of habitat in the marsh used by bird species for foraging, roosting and nesting. In addition the proposed works involve the removal of trees marsh used by bird species for foraging, roosting and nesting. The plans for tree removal for construction of the proposed scheme are shown in the landscape drawings in **Appendix 4.2**.

An assessment of potential effects associated with loss of habitat is presented in **Section 10.5.4.1**. Relevant measures necessary to avoid the risk of impact are detailed in **Section 10.6**.

10.5.3.5 Invasive Species

In **Section 10.3.3.1** it is noted that activities proposed for the construction phase will be undertaken in the vicinity of invasive plant species. Consequently, there is a risk of the spread of invasive species and impacts to terrestrial biodiversity. The Arklow FRS Construction Environmental Management Plan (CEMP) is provided in **Appendix 5.1** includes an invasive species management plan (see **Section 10.6.2.5** for further details).Within construction Compound SC1 and SC3 Butterfly Bush (*Buddleia davidii*) has been recorded (see **Section 10.4.5.6**, **Section 10.4.5.8).** There is also an area of mixed native and introduced shrubs and trees including the invasive species *Rhododendron* running across the marsh area (see **Section 10.4.5.6**, **Section 10.4.5.8**).). This area coincides with the proposed flood defence embankment area (see **Figure 10.14**). *Rhododendron* has also been recorded within SC1.

Management measures for the species are given in **Section 10.6.**

10.5.4 Impact Assessment

10.5.4.1 Impact Mechanism 1 Discharges

The biological receptors of concern with regards to Impact Mechanism 1 Discharges are:

- Fish
- Otter
- Benthic Habitats

- Birds

Sediment Release

As with any construction activity, the activities proposed for this development including construction, excavation/ dredging operations and the installation/ removal of temporary river access points, haul roads and causeways and the annual removal of debris from the debris and silt traps will result in the release of sediment to the river adjacent to, and downstream of, the development site. Excessive suspended sediment loads can negatively impact riverine and estuarine flora and fauna.

Excessive deposition of suspended sediments can cause stress and affecting the gills, resulting in injury or mortality and the loss of suitable fish spawning habitat and declines in egg and early life stage success rates.

As noted above in the section on fish and on the description of the estuary, the tidal section of the Avoca River and the impact of both historical mining and the disposal of untreated sewage effluent on sediment chemistry, habitat quality of the lower reaches of the river bed make it an unsuitable area for fish to lay eggs. Increased turbidity can reduce feeding rates and affect prey abundance and predation efficacy in visual feeders such as salmon and otter.

As the Avoca River will for the great majority of the tidal cycle be flowing in an easterly direction (*ca* 10 hours), sediment laden water will be washed downstream and out to sea and as described above, as this section of the river is poor in fauna, the impact of this sediment laden water on biota is considered to be low. It should also be noted that species such as Lamprey, Salmon, Seatrout evolved over geological time to migrate through estuaries on their way to spawning grounds and as many estuaries are naturally high in turbidity, these species evolved mechanisms to deal with high suspended sediment loads.

It is also considered that when tidal forcing is affecting the Avoca River upstream of the bridge, due to the low tidal exchange rate brought about by the near-by tidal node, velocities will be very weak and will not transport sediment particles far from the dredge site and that they will fall out to the river bed within a short distance. Furthermore, it is planned that the dredging activity will last on average 10 hours per day after which it will stop. This will allow the sediment laden water to be effectively flushed out of the river completely.

Levels of back ground suspended solids vary from river to river: McMahon and Quirke (1992 record values in the Shannon ranging from 1 mg/l up to 86 mg while Walsh *et al.* (2012) record values of 1 mg/l – 2 mg/l, 1 mg/l – 6 mg/l and 1 mg/l – 20 mg/l in different parts of the Nore River. AQUAFACT recorded a value of 200 mg/l in Cork Harbour *ca* 10 m away from a dredger excavating sediments as part of the construction of the Lee Tunnel and a value of 4,000 mg/l in Galway Bay in 2011 during a severe storm event.

Figure 10.19 below shows the sediment plume from the Avoca River dispersing northwards into the Irish Sea. This image suggests that the Avoca River is naturally quite turbid.

While the Avoca naturally turbid conditions there remains potential that dredging activity may result in effects to Lamprey, Salmon. In order to further reduce any potential effect of the dredging on migrating fish species *e.g.* Lamprey and Salmon, dredging shall not be carried out between October to April.

Otter are visual hunters with good eyesight both above and below the water. The release of sediments in the water column during excavation and construction and the resuspension of sediments during dredging has the potential to significantly affect turbidity levels. Otter is a highly mobile species and while their eyes are adapted for seeing food item in murky or dark water, they will avoid areas of excessive turbidity. While local increases in turbidity may result in the temporary displacement of the species, there are extensive alterative areas of otter habitat available to the species away from the project area. Consequently, there is no risk of significant effects from discharges to otter.

The increase in turbidity could result in increased siltation, smothering of organisms and a reduction of light for phytoplankton following construction activities and dredging. High levels of suspended solids settling on the seabed can alter habitats resulting in a potential loss of feeding and spawning grounds. Mobile species may move away from unfavourable conditions, however sessile, benthic fauna may be smothered and lost.

It should be noted that the effect of increased turbidity, if realised, will be short lived. In addition, any effects are not likely to be significant for local sedimentary habitats and fauna, as the area is naturally turbid (see above) and hydrodynamically active and likely experiences a high degree of natural suspended solids due to the current tidal regime and sedimentary nature of the area. Consequently, there is no risk of significant effects to benthic habitats.

Without the implementation of construction best practice and mitigation measures, activities during the construction of the embankment at Arklow Town Marsh pNHA could result in the uncontrolled release of sediment material to the nearby river and habitat types likely to be used by the SCI species, affecting the availability of food items targeted by foraging birds. Similarly water runoff from stockpiles of excavated material could impact SCI bird foraging at the habitats through the introduction of sediment and chemical pollutants. Mitigation measures and the general construction practices required to prevent adverse effects are detailed in **Section 10.6**.

Figure 10.19: Sediment plume from the Avoca River dispersing into the Irish Sea.

Release of contaminants and elevated chloride concentrations from excavated dredge material

There is a risk runoff from stockpiles of excavated dredge material, in particular during dewatering, may result in the introduction of hazardous and non-hazardous material, and elevated chloride concentrations water to the nearby river channel, impacting water quality.

Accidental release of hydrocarbons from plant machinery and fuel stocks, and organic polymers or heavy metals associated with cementing/ concreting materials used for construction activities. These materials are toxic to organisms in sufficient quantities and will potentially contaminate the seabed sediments adjacent to the project, inhibiting recolonisation of the area after construction and dredging.

Mitigation measures specifically designed to avoid the introduction of sediment and contaminants in runoff to the river channel are detailed in **Section 10.6**. Mitigation measures are not necessary to address the introduction of slightly elevated chloride concentrations run off into the river during excavation given the tidal influence on this section of river.

Mitigation measures to address runoff from contaminants at the site compounds are detailed in **Section 10.6** At SC5 runoff with elevated chloride concentrations will be directed to the Irish sea; given the relatively small volume of runoff from the dredge material and the full marine salinity of the receiving waters (~35ppt) there will be no effect local salinity levels.

Chemical contamination of river channel and sediment could also occur from accidental spillages, such as oil and other chemicals through poor operational management, the non-removal of spillages, poor storage, handling and transfer of oil and chemicals.

If suitable precautions are taken and best practice for the storage, handling and disposal of such material are followed, impacts should be minimal.

Mitigation measures specifically designed to avoid the introduction of runoff and contaminants to the river channel are detailed in **Section 10.6**.

Accidental spillages will be contained and cleaned up immediately. Remediation measures will be carried out in the unlikely event of pollution of the marine environment (see **Section 10.6).**

Seepage of runoff with elevated chloride concentrations

As outlined above, runoff with elevated chloride concentrations will arise during the placement of excavated dredge material at SC1 for archaeological examination and stockpiling. This material will also be reused in the flood embankment and runoff will percolate into the ground. The runoff will disperse in the generally vicinity of the percolation and be ultimately diluted by groundwater. The maximum depth of dredging will be approximately 1.0m. Median salinity levels of sediments 1m below river bed is approximately 62mg/l.

The median salinity level of groundwater at the marsh area is 50mg/l, while the EPA reports salinity levels in the Avoca River (around the bridge) at approximately 1500mg/l (*i.e.* 1.5ppt). At SC1 any effect of runoff with elevated chloride concentrations on the salinity levels of groundwater would be negligible and significantly less than the current natural periodic flooding of the marsh area by the Avoca.

10.5.4.2 Impact Mechanism 2 Loss of In-River Habitats and Impact Mechanism 4 Loss of Terrestrial

The biological receptors of concern are:

- Benthic Habitats
- Birds - Potential *ex-situ* effects to SPAs
- Birds - Potential *in-situ* effects to resident bird species
- Otter

Benthic Habitats

The proposed dredging of river sediments will result in the loss of river bed including the construction of river access points, temporary causeways and the installation of the debris and gravel trap and riprap within the river channel. As noted above however, the biological diversity of in-river sediments is low, and the conservation significance of the loss is considered therefore to be low.

Loss of species due to dredging will be temporary as larvae, whether from fresh water or marine sources will quickly re-colonise to newly exposed sediments post-dredging. Consequently, there is no risk of significant effects to benthic habitats.

Potential ex-situ effects to SPAs

As shown in **Section 10.4.6** at total of of 24 SCI bird species of SPAs have been recorded in the proposed development area and adjacent pNHA. The species are listed in **Table 10.13** alongside species ecology (feeding guilds, habitat preference typical diet, foraging behaviour *etc*.) and maximum recorded foraging ranges.

As outlined in **Section 10.4.3**, of the 24 SCI species, effect to 17 SCI species were screened out while 7 SCI species were brought forward to the NIS for further assessment of *ex situ* effects due to the loss of marsh habitat and in-river habitat. The 7 SCI species brought forward to the NIS are highlighted in **bold** in **Table 10.13**. The SPAs designated for the species considered in the NIS are listed in **Section 10.4.3.**

The construction of the flood wall and installation of the embankment upstream of the river at Arklow Town Marsh pNHA will result in loss of river habitat and habitats within the Arklow Town Marsh pNHA; estimates of the extent of habitats lost due to installation of flood walls and embankment is presented in **Table 10.14**.

Based on the SCI species feeding guilds, habitat preference and typical diet (described in **Table 10.13**) six habitat types are likely to be suitable to the SCI species possibly used by the species for foraging are highlighted in **bold** in **Table 10.14**. The habitats possibly used by the species are:

- FS1 Reed and tall sedge swamp
- FS2 Tall-herb swamp
- GA1 Improved agricultural grassland / GS4 Wet grassland
- GS4 Wet grassland
- WL2 Treelines
- WS1 Scrub

In addition to the terrestrial habitats listed above, the aquatic habitat CW2 Tidal Rivers / FW2 Depositing Lowland Rivers, which includes the in-stream vegetated islands and gravel bank located upstream of the Arklow bridge, is of importance to the SCI species.

While the proposed development will result in the loss of parts of terrestrial habitat types within the Arklow Town pNHA likely to be used by SCI species, in each case, the area of habitat lost relative to the total area of the habitats area within the Arklow Town March pNHA is small. As the area of terrestrial habitats lost is small relative to the area available to the species, there is **no risk of significant adverse** of *ex situ* effects to the SCIs.

Within the aquatic habitat CW2 Tidal Rivers / FW2 Depositing Lowland Rivers, the vegetated islands provide roosting for bird species while birds, in particular gulls, use the gravel banks to roost on, and bathe and preen in the water of the river. The removal of the vegetated islands and gravel bank will result in the loss of approximately 0.2 ha of habitat potentially used by the SCI bird species.

The area lost is extremely small relative to the extent of habitat used by the SCI bird species in the area and within SPA sites designated for the species. Consequently, it is concluded that there will be **no risk of significant** *ex-situ* effects to SCI species due to habitat loss.

Table 10.13: Special Conservation Interest Species of SPA. SCI species brought forward to the NIS are highlighted in bold.

Foraging Guild (Weller 1999)	Special Conservation Interest Species	Habitat Preference and Diet (IUCN and Bird Watch Ireland)
Surface swimmer	A053 Mallard (*Anas platyrhynchos*)	The species occurs in almost every wetland type although it generally avoids fast-flowing, oligotrophic deep, exposed, rough, rockbound waters and hard unvegetated areas such as rocky ground, sand dunes and artificial surfacing. It requires water less than 1 m deep for foraging and shows a preference for freshwater habitats although it may frequent shallow brackish waters as long as they provide the cover of submerged, floating, emergent or riparian vegetation, dense reedbeds or overhanging branches. Its diet consists of seeds and the vegetative parts of aquatic and terrestrial plants (*e.g.* crops) as well as terrestrial and aquatic invertebrates (especially in the spring and summer) such as insects, molluscs, crustaceans, worms and occasionally amphibians and fish.
	A052 Teal (*Anas crecca*)	They usually nest near small freshwater lakes or pools and small upland streams away from the coast, and also in thick cover. During winter species is widespread on wetlands with good cover, such as reedbeds. Wide variety of habitats, both coastal and inland, and usually below an altitude of 200 metres, including coastal lagoons and estuaries and inland marshes, lakes, ponds and turloughs Small seeds predominate, but Enteromorpha sp. and molluscs are also frequently taken. Occasionally feed on chironomid larvae where available, though usually during the summer months. They feed by day where they are safe from shooting.
	A059 Pochard (*Aythya ferina*)	Its diet consisting of seeds, roots, rhizomes, the vegetative parts of grasses, sedges and aquatic plants as well as aquatic insects and larvae, molluscs, crustaceans, worms, amphibians and small fish. This species requires well-vegetated eutrophic to neutral swamps, marshes, lakes and

Foraging Guild (Weller 1999)	Special Conservation Interest Species	Habitat Preference and Diet (IUCN and Bird Watch Ireland)
		slow-flowing rivers with areas of open water and abundant emergent fringing vegetation.
	A061 Tufted Duck (*Aythya fuligula*)	The species is omnivorous feeding mainly on molluscs, gastropods, crustaceans and aquatic insects, as well as seeds and vegetative parts of aquatic plants. It is common on large, freshwater lakes, ponds, reservoirs, gravel-pits and quiet stretches of wide slow-flowing rivers during this season
Water column diver (shallow)	A067 Goldeneye (*Bucephala clangula*)	Suitable habitats include freshwater lakes, pools, rivers and deep marshes surrounded by coniferous forest Nests in hollows of mature trees. The species will preferentially nest in trees in open stands near water or solitary trees on the edges of marshes, rather than in trees in dense stands in order to increase the ease of entry by flying. The species will also nest in artificial nest-boxes.
	A229 Kingfisher (*Alcedo atthis*)	Suitable habitats include freshwater lakes, pools, rivers and deep marshes surrounded by coniferous forest Found by still or slow flowing water such as lakes, canals and rivers. Typically observed on branches beside streams or river. Lays egg in nest at the end of riverbank burrows. Main prey is fish but will also consume aquatic insects, flies (Diptera), butterflies and moths (Lepidoptera), amphibians (Rana), crayfish (*Astacus*), prawns (*Palaemon*),amphipods (*Gammarus*) and isopods in winter. Very occasionally it feeds on berries (*Rubus, Sambucus*) and stems of reed (*Phragmites*). In areas where freezing conditions occur in winter, it regularly migrates south, but generally stays within the species' breeding range. Southern populations are usually sedentary (Woodall 2016).
Water column diver (deeper)	A017 Cormorant (*Phalacrocorax carbo*)	Found in coastal/ marine waters. Diet consists predominantly of fish, including sculpins, Capelin, gadoids and flatfish as well as crustaceans, amphibians, molluscs and nestlings. At sea, the species preys mostly on bottom-dwelling fish, occasionally also taking shoaling fish in deeper waters. It is a generalist, known to feed on at least 22 different fish species.
	A001 Red-throated Diver (*Gavia stellata*)	Species breeds on freshwater pools or lakes in open moorland, blanket bogs or open and wet peatland habitats. It will nest on pools as small as 10-20 m long or on lakes up to 5 ha in area, showing a preference for those in treeless areas that have well-vegetated margins and low islets or promontories on which to nest. It generally avoids waters with dense floating or emergent vegetation and steep rocks above the water. Outside of the breeding

Foraging Guild (Weller 1999)	Special Conservation Interest Species	Habitat Preference and Diet (IUCN and Bird Watch Ireland)
		season, the species frequents inshore waters along sheltered coasts, occasionally occurring inland on lakes, pools, reservoirs and rivers. Its diet consists predominantly of fish as well as crustaceans, molluscs, frogs, fish spawn, aquatic insects, annelid worms and plant matter.
Intertidal walker (in and out of water)	**A160 Curlew (*Numenius arquata*)**	**The species frequents muddy coasts, bays and estuaries with tidal mudflats and sandflats, rocky and sandy beaches with many pools, saltmarshes coastal meadows and pasture and muddy shores of coastal lagoons. It also utilises wet grassland and arable fields during migration. Its diet consists chiefly of annelid worms and terrestrial insects especially during the summer although it will also take crustaceans, molluscs, polychaete worms.**
	A130 Oystercatcher (*Haemat opus ostralegus*)	**Forages on intertidal soft substrates on bivalves and gastropods. Polychaetes and crustaceans are more important in estuaries however, and molluscs are most important on rocky shores. When inland, prey such as earthworms and insect larvae (*e.g.* caterpillars and cranefly larvae) are also taken.**
	A140 Golden Plover (*Pluvialis apricaria*)	Diet consists of small crustaceans, molluscs, polychaete worms, isopods, amphipods, insects (*e.g.* ants, beetles, flies and fly larvae) and millipede. Found on muddy, sandy or pebbly coasts.
	A137 Ringed Plover (*Charadrius hiaticula*)	Its diet consists of small crustaceans, molluscs, polychaete worms, isopods, amphipods, insects (*e.g.* ants, beetles, flies and fly larvae) and millipede and favours muddy, sandy or pebbly coasts in the tropics and subtropics including estuaries, tidal mudflats, sandflats and exposed coral reefs.
	A142 Lapwing (*Vanellus vanellus*)	**Its diet consists of adult and larval insects (*e.g.* beetles, ants, Diptera, crickets, grasshoppers, dragonflies, mayflies, cicadas and Lepidoptera), spiders, snails, earthworms, frogs, small fish and seeds or other plant material. The species shows a preference for breeding on wet natural grasslands meadows and hay meadows with short swards and patches of bare soil at low altitudes.**
	A028 Grey Heron (*Ardea cinerea*)	Generalist in its habitat use, although shallow water, relatively large prey, and four or five months of ice-free breeding season are among the essential characteristics of its habitat. Mainly feeds on fish and eels 10-25 cm long, as well as amphibians,

Foraging Guild (Weller 1999)	Special Conservation Interest Species	Habitat Preference and Diet (IUCN and Bird Watch Ireland)
		crabs, molluscs, crustaceans, aquatic insects, snakes, small rodents, small birds and plant matter.
	A169 Turnstone (*Arenaria interpres*)	Its diet consists of insects, crustaceans, molluscs, annelids, echinoderms, small fish, carrion and birds' eggs. The species favours intertidal rocky shores and quay and pier surfaces.
Surface swimmer/ Water column diver (shallow)/ Terrestrial walker	A125 Coot *(Fulica atra)*	This species is omnivorous, although its diet consists primarily of vegetable matter such as algae (*e.g. Chara, Cladophora, Spirogyra*), the vegetative pasts of aquatic and terrestrial plants. The species inhabits large, still or slow-flowing waters and shows a preference for shallow water with adjacent deeper water (*e.g.* > 2 m) for diving, and muddy substrates, marginal, emergent, floating or submergent vegetation.
Surface swimmer/ Water column diver (shallow)	A004 Little Grebe *(Tachybaptus ruficollis)*	Species inhabits a wide range of small and shallow wetlands usually less than 1 m deep with rich vegetation and high densities of aquatic invertebrates, generally avoiding waters with large predatory fish. Suitable habitats include small lakes, ponds, the sheltered bays and vegetated shores of larger freshwater, alkaline or saline lakes and reservoirs, slow-flowing rivers, canals flood-plain oxbows, coastal brackish lagoons, seasonally inundated areas, swamps. Outside of breeding season it is common on more open waters and is occasionally observed along the coast in estuaries or sheltered bays protected from strong wave action. Diet consists predominantly of adult and larval insects, especially mayflies, stoneflies, water bugs, beetles, flies, caddisflies and dragonflies, as well as molluscs, crustaceans, adult and juvenile amphibians and occasionally small fish during the winter.
Surface swimmer/ Water column diver (shallow)/ Intertidal walker (out of and in water) / Terrestrial walker	**A183 Lesser Black-backed Gull (*Larus fuscus*)**	**Species breeds in colonies, showing a preference for level-ground that is well covered with fairly close, short vegetation, often nesting under heather, bracken or other vegetation (sometimes under pine trees). Suitable sites include flat, unbroken grassy slopes, sand-dunes, the tops and ledges of coastal cliffs, rocky offshore islands, saltmarshes, the margins of inland lakes, islands in lakes and rivers, and high moorland, although the species will also nest on buildings and rooftops. Outside of the breeding season the species chiefly inhabits inshore and offshore seas, as well as lagoons, estuaries, harbours and seashores. It may also frequent inland habitats during this season, such as large lakes and rivers. The species is an omnivorous, opportunistic feeder that forages extensively at**

Foraging Guild (Weller 1999)	Special Conservation Interest Species	Habitat Preference and Diet (IUCN and Bird Watch Ireland)
		sea. Its diet consists of small fish, aquatic and terrestrial invertebrates (*e.g.* beetles, flies and larvae, ants, moths, grasshoppers, crustaceans, molluscs, segmented worms and starfish), bird eggs and nestlings, carrion, offal, rodents, berries and grain. It often follows fishing fleets, feeding on discarded bycatch.
	A184 Herring Gull (*Larus argentatus*)	**Species inhabits coastal and near-coastal areas but may also forage inland on large lakes and reservoirs, fields and refuse dumps. It has no specific breeding habitat but may show a preference for rocky shores with cliffs, outlying stacks or islets, otherwise nesting on rocky and grassy islands, sandy beaches, gravel bars, saltmarshes, rocky outcrops, buildings. When inland on migration the species also shows a preference for large river valleys. The species has a highly opportunistic diet and will exploit almost any superabundant source of food. It takes fish, earthworms, crabs and other marine invertebrates (*e.g.* molluscs, starfish or marine worms), adult birds, bird eggs and young, rodents, insects (*e.g.* ants), berries and tubers. It also scavenges at refuse dumps, fishing wharves and sewage outfall zones and frequently follows fishing boats.**
	A179 Black-headed Gull (*Chroicocephalus ridibundus*)	**Terrestrial and coastal marine (mainly feeding on: aquatic and terrestrial insects, earth worms and marine invertebrates and some dead/sick fish).**
	A182 Common (or Mew) Gull (*Larus canus*)	Its diet consists of earthworms, insects, aquatic and terrestrial invertebrates, crayfish and molluscs and small fish. On the coast it nests on grassy and rocky cliff-ledges, grassy slopes, inshore rocky islets, islands and stacks, and on sand and shingle beaches, banks and dunes amongst tide-wrack or flood debris Inland the species nests on small islands in freshwater and saline lakes, shingle bars or small islets in streams or rivers islets, artificial structures and shores of artificial waterbodies with short, sparse vegetation.
Surface swimmer/ Intertidal walker (out of water),	**A050 Wigeon (*Anas penelope*)**	**It is vegetarian and consumes the leaves, seeds, stems and root bulbs of pond weeds, fine grasses. Mainly uses Grassland, Wetlands (inland), Marine Neritic, Marine Intertidal, Marine Coastal/Supratidal.**
Surface swimmer/ Terrestrial walker	A043 Greylag Goose (*Anser anser*)	In the winter, the species inhabits lowland farmland in open country, swamps, lakes, reservoirs, coastal lagoons and estuaries. The species is herbivorous, its diet consisting of grass, the roots, shoots, leaves,

Foraging Guild (Weller 1999)	Special Conservation Interest Species	Habitat Preference and Diet (IUCN and Bird Watch Ireland)
		stems, seedheads and fruits of other herbaceous marsh vegetation, aquatic plants, and agricultural grain and potatoes (especially in the winter).
Terrestrial walker	A395 Greenland White-fronted Goose (*Anser albifrons flavirostris*)	Species winters in open country on agricultural land, improved grassland, stubble fields, and wet meadows or in brackish and freshwater marshy habitats such as upland bogs, peatlands and floodlands. It may also roost on tidal marshes, in sheltered bays or in estuaries and frequents inland lakes. The species is herbivorous, its diet consisting of the roots, leaves, stems, seeds and fruits of terrestrial plants such as herbs, grasses and sedges, as well as agricultural grain, wheat, rice and barley, potatoes and sprouting cereals (especially in the winter).

Table 10.14: Area of habitats lost at Arklow Town pNHA

Habitat (Fossitt classification)	Hectares Lost Habitat within pNHA and planning boundary	Hectares Lost Habitat outside pNHA but within planning boundary	Total Hectares Lost
GA1 Improved agricultural grassland / GS4 Wet grassland	1.37	0.83	2.20
FS1 Reed and tall sedge swamp	1.05	0.28	1.33
WL2 Treelines	0.31	-	0.31
WS1 Scrub	0.19	-	0.19
FS2 Tall-herb swamp	0.01	-	0.01
GS4 Wet grassland	0.12	-	0.12
CW2 Tidal / FW2 Depositing Lowland Rivers	0.20	-	0.20

Potential in-situ effects to resident bird species

As described above, the vegetated islands and gravel banks which are located immediately upstream of the Arklow Bridge will be removed as part of the development are used by a range of birds for roosting, resting, bathing and preening.

The habitats, in particular the gravel banks, are not well represented in the Arklow area; consequently, the loss of the habitats would be result in significant changes to bird behaviour in the area.

In order to mitigate effect on bird's behaviour due to the loss of in-river gravel beds due to the river dredging works, it is proposed to install three roosting platforms in the river channel upstream of Arklow Bridge. Along River Walk and South Bank riparian habitat/refuge areas will be also created to mitigate direct and indirect effects of the river dredging works on birds.

As described above the work involve the removal of trees to accommodate the construction of the FRS. The impact of the removal of trees during construction on bird foraging, roosting and nesting will be mitigated through the tree/landscape planting. Detail of the planting proposed is presented in **Appendix 4.2**.

Section 10.6.4 also describes the installation of nesting boxes at Arklow Bridge for the Red-listed species Grey wagtail and for Pied wagtail. These species have been consistently recorded along the Avoca River banks and feeding on exposed gravels.

Otter

As noted in **Section 10.4.10.4**, whilst otter runs, slides and holts were not identified during the walkover surveys within the planning boundary, otter have been observed using the river in the Arklow area and it is likely that the vegetation at the banks of the Arklow Town pNHA may provide suitable habitat for the species. Potential mitigation required for resident otter is presented in **Section 10.6.6.**

10.5.4.3 Impact Mechanism 3 Noise Disturbance

Construction activity including the construction and installation of earth embankments, demolition works, pilling operations, dredging, construction traffic movements, removal and disposal of dredge spoil and removal of debris from the brash trap will result in noise emissions resulting in disturbance to both aquatic and terrestrial taxa.

The taxa considered here with regard to Impact Mechanism 3 Noise Disturbance are:

- Marine Mammals
- Fish
- Otter
- Bats

Marine Mammals

As outlined in **Section 10.4.10.3** the Arklow River Avoca River and Arklow FRS development area does not represent an important foraging area for the marine mammals. As the area is highly unlikely to support significant number of marine mammal species it is possible to rule out the potential for significant effects.

With regard to impact of noise on marine mammals, the record of one Common Seal in the estuary is not considered of sufficient significance to merit the necessity of marine mammal observer to be on site during the construction period.

Fish

Noise is readily transmitted underwater and there is potential that that diadromous fish species moving/ migrating through the project area may be present during construction activities. Sound is perceived by fish through the ears and the lateral line (the *acoustico-lateralis* system) which is sensitive to vibration. Some species of fish such as salmon have a structure linking the gas filled swim bladder to the ear. The swim bladder is sensitive to the pressure component of a sound wave, which resonates as a signal that stimulates the ears. These species, therefore, usually have increased hearing sensitivity. Such species are considered to be more sensitive to anthropogenic underwater noise sources than species, such as lamprey, that do not possess a structure linking the swim bladder and inner ear.

Hearing in salmon is considered to be relatively poor, with the species responding only to low frequency tones (below 0.38 kHz). While there are no data available for hearing in lamprey, it is highly unlikely that they detect sound close to 10 kHz (Popper, 2005). The lamprey ear is relatively simple and there is nothing within the structure of the ear or associated structures to suggest any specialisations that would make them into anything but a hearing generalist, with maximum hearing to no more than several hundred Hz. Noise disturbance can result in auditory injury and behaviour changes.

Exposure to high energy noise emissions (piling, drilling, seismic noise) can result in recoverable auditory injury (termed Temporary Threshold Shift [TTS]) and non-recoverable auditory injury (termed Permanent Threshold Shift [PTS]). Behavioural reactions to acoustic exposure are generally more variable, context-dependent, and less predictable than the effects of noise exposure on hearing or physiology. This is because behavioural responses to anthropogenic sound are dependent upon operational and environmental variables, and on the physiological, sensory, and psychological characteristics of exposed animals.

It should be noted that the potential impact of noise on fish in open water are considered to be minimal as they can readily move away from the noise source (Popper, 2005). Experiments on fry demonstrated balance problems resulting from exposure to an energy source, however, the effects were temporary with full recovery observed after a few minutes upon cessation of the noise (Kostyuchenko, 1971). Some studies of high energy seismic noise sources have also demonstrated fish's ability to acclimatise to noise associated with an energy source over time (*e.g.* Chapman and Hawkins, 1969).

Prolonged exposure of individual fish to injurious noise from construction noise and vibration is unlikely occur as fish are unlikely to stay in the vicinity noise sources.

Based on the above it can be concluded that there will be no significant adverse effects to the diadromous fish species from noise.

Otter

Otters are quite tolerant of human disturbance and are often recorded in urban areas. Otter are mainly active in the early morning and/ or late evening. Given this behaviour, it is unlikely that the species will be active in the project area during operations and encounter rates will be low; consequently, significant disturbance effects will not occur. It is possible that while ongoing, construction activity will deter otter from foraging in the immediate project area. It should be noted however that given the general daylight timing of construction activities, any disturbance resulting in displacement of the species will be temporary and short lived and will not result in significant effects. In addition, there are extensive alterative areas of otter habitat available to the species away from the project area.

Bats

Bat Roosts

The Arklow Bridge bat roost will be subjected to considerable disturbance and disruption and may be temporarily lost during the work carried out here or permanently lost through any work carried out on the bridge structure. The following works will potentially impact on the bat roost:

- Repairs to Arklow Bridge will remove crevice roost sites for bats such as the Daubenton's bat.
- Vegetation on the bridge is required to be removed for engineering integrity reasons.
- There is the potential for leakages of grout getting into the river
- There will be permanent loss of riverbed habitat where the scour protection is constructed.
- Underpinning of the bridge piers and abutments;
- Lowering of the floor of the Arklow Bridge by approximately metre;
- Provision of scour protection to the bridge piers; and
- Repairs to the masonry work of the older section of the bridge.

In all, this creates a long-term moderately negative impact upon bats.

The approach for carrying out the works on the bridge will be as follows. All bridge works (phases 1-4) will be fully completed for approx. a third of the bridge each year. Note that the working area will extend beyond a third to allow for bunds, working space, *etc.* In-stream works are restricted to the summer season due to fisheries constraints, therefore it is not possible to carry out the in-stream underpinning works between 1st September and-31st March.

- Year 1 (2022) - Works to southern half of the bridge (phases 1-4). There will be considerable disturbance in the southern half during that summer but there will be little/no disturbance to northern half of the bridge for first year.

- Year 2 – Works to central part of the bridge (phases 1-4). There will be little/no disturbance to southern quarter of bridge and little disturbance to northern quarter of bridge (passing construction traffic) for second year;
- Year 3 - Works to northern half of the bridge (phases 1-4). There will be considerable disturbance in the northern half during that summer but there will be little/no disturbance to southern half of the bridge for third year.

Overall, the potential impact would be loss of Actual and Potential Roosts and Risk of Injury to Bats.

Lighting

There will be an increased level of lighting through illumination during the 4 year construction period required for night-time work at the river. There may be an increased level of lighting brought about through tree removal and exposure of the area to the town lighting. Lighting upon the bridge at present is most probably intrusive for roosting bats but is primarily focussed to the east of the bridge while roost sites are to the western side of the bridge. This may create disturbance of light intolerant or shy species at present while the more urban-adapted species will be affected only over a short-term period. Of the species noted on and around the site, no bats would be considered light intolerant as they will generally avoid direct illumination but are not usually fully excluded by the presence of light.

Lighting for the night work may be more disruptive as it will need to create suitable illumination for work as well as access.

Pipistrelles, the main species within the area, are negatively affected by lighting but to a lesser extent than most Irish species. Leisler's bats are the most tolerant of light of the three species noted. This species will feed around lighting in car parks as the night progresses. There are no roosts directly illuminated by changes to the site as there were no roosts noted within the site in June 2016 or in August 2017.

Lighting will be increased by the presence of lighting for night-time work and as regards long-term changes by vegetation clearance and no additional lighting is foreseen for the Flood Relief Scheme. Species such as common pipistrelle and Leisler's bat are less affected than all other Irish bat species (but are less common in lit sites than in dark sites of similar habitat) and this would not be a significant impact overall in the current situation. Lighting along the river is higher in 2020 than in it was in 2016 or 2017.

At worst, it would be a permanent slightly negative impact as well as a short-term moderately negative impact.

Removal of vegetation and reduced feeding

There will be tree felling and some scrub removal within the river. The mature conifers along the river have already been removed but there may be some further tree removal here, of which there is low to no roost potential considered for the remaining trees. The provision of any screening with vegetation provides feeding and commuting potential for bats.

There will be alterations (removal) to the vegetation including mature trees within the river.

Dredging will affect insect availability and would affect feeding success within this area for bat species such as Daubenton's bat and soprano pipistrelle in particular. There will be reduced feeding at Arklow Bridge from the removal of trees and small islets within the river. Dredging will affect insect availability. Feeding loss around the existing trees may constitute a long-term slightly negative impact. Dredging may create a short-term moderate negative impact.

Cumulative Loss of Feeding and Commuting

The changes within Arklow, if following current trends would see a loss in green space, increase in lighting and increase in modern buildings with an associated removal of old buildings for some developments. These would all create a permanent moderate negative impact if not appropriately mitigated in each project.

10.5.5 Cumulative Effects

10.5.5.1 Initial Screening

This assessment of potential cumulative effects considers the potential impact associated with the proposed Arklow FRS development that in combination with other plans and project may result in significant effects to biological receptors of the environment outlined in **Section 10.3**.

Where necessary mitigation envisaged to avoid, prevent, reduce and where or, if possible, offset any identified significant effects on the environment during construction and operation phases of the development.

To inform the assessment of potential in combination effects a review of consent applications of current and proposed projects in the vicinity of the proposed project included on the following web-sites was completed in April 2021:

- Department of Housing, Local Government and Heritage (DHLGH) – Foreshore Applications
    - https://www.housing.gov.ie/planning/foreshore/applications/
- DHPLG - EIA Portal
    - https://www.housing.gov.ie/planning/environmental-assessment/environmental-impact-assessment-eia/eia-portal
- Wicklow Council - Planning System
    - https://www.wicklow.ie/Living/Services/Planning/Planning-Applications

Assessments of current and proposed projects listed on above websites identified potential cumulative effects from the following projects (in combination effects assessed in **Section 10.4.4.2**):

- Circle K Safeway Service Station (20426) - This project relates to the demolition of the existing, and construction of a new, fuel forecourt at the existing Circle K service station, which is located adjacent to Arklow Town Marsh and SC1 of the proposed scheme.

Both the Circle K project and Arklow FRS development carry the risk for the uncontrolled release of discharges including sediment laden water or other waste material pollution, to the nearby marsh habitats and river. There is potential that these discharges may act in combination to directly impacting habitat and water quality, and indirectly effect the availability of food items used by SCI birds foraging in the area. Further detailed consideration of the potential for in combination effects is required (see **Section 10.5.5.2**).

- FS006862 Irish Water - Arklow Waste Water Treatment Plan - The proposed Arklow Wastewater Treatment Plant Project comprising a new Wastewater Treatment Plant, associated infrastructure including sewer network and marine outfalls as well as an upgrade to existing coastal revetment. The proposed WwTP project planning boundary is concentrated around the waterfront area of Arklow, with the proposed interceptor sewers located along the northern and southern banks of the Avoca River channel and the WwTP located at the Old Wallboard site at Ferrybank. Given the relative location of the WwTP project and FRS development planning boundary areas there is potential for in-combination effects. Further detailed consideration of the potential for in combination effects is required (see **Section 10.5.5.2**).
- FS007049 Sure Partners Site Investigations at Arklow Bank – Site investigations proposed at sites and harbour marina on the south shore immediately adjacent to works proposed at the marina for the Arklow FRS development area. Further detailed consideration of the potential for in combination effects is required (see **Section 10.5.5.2**).

Potential cumulative effects from the following projects were excluded based on the distance from the Arklow FRS development:

- Action Health Enterprises GP Limited the Former Boland's Builders Providers, Castle Park (181170) - This project relates to the development of a primary care facility at Castle Park.
- Frank & Sandra Duffy No 7 and 8 Bridge Street &, No 34 Main Street (19750) - The project relates to the demolition of 2 existing buildings and the construction of a new retail and commercial building on Main Street.
- Gaines Europe Ltd Unit 1A Lower Tinahisk, South Quay (16248) - This project relates to the development of a new warehouse and distribution facility at Arklow Harbour.
- Gaines Europe Ltd Tinahisk Lower, South Quay (16414) - This project relates to the demolition of an existing industrial building at Arklow Harbour.
- Joby Developments North Quay, Arklow (15857) – This project relates to the demolition of existing structures and the construction of 2 no. 5 storey blocks.
- Mill Sea Ltd North Quay, Arklow (18316) – This project relates to the demolition of existing disused industrial buildings.
- Crag Digital Avoca Limited (18940/201285) – This project relates to the construction of a data storage facility comprising 3 data storage buildings in the Avoca River Business Park.

- Parade Ground (186) – This project relates to the transformation of the streetscape and public realm.
- Arklow Bank Wind Park Phase 2 Onshore Grid Infrastructure (Pre-application 306662) – This project relates to the onshore grid infrastructure to the Arklow Bank Phase 2 wind park.
- 20469 (Wicklow County Council Inner Harbour / Dock, Off South Quay) - Construction of 14 Storage units and associated site works

10.5.5.2 Assessment of Potential Cumulative Effect

Circle K Safeway Service Station

The project involves the demolition of the existing, and construction of a new, fuel forecourt at the service station, which is located adjacent to Arklow Town Marsh and SC1 of the proposed scheme. The Circle K project carries a risk of generation of discharges.

Consent to undertake the Circle K project will be subject to conditions that will require that activities are undertaken to ensure significant impact associated with discharges do not occur. As outlined in **Section 10.5.4.1** the biological receptors of concern with regard discharges are:

- Fish
- Otter
- Benthic Habitats
- Birds

Activities proposed for Arklow FRS development will be require implementation mitigation measures (see **Section 10.6** and the Construction Environmental Management Plan (CEMP) in **Appendix 5.1**) that will ensure no significant release of sediment in laden water and runoff chemicals or other waste material pollution into the Arklow River or marsh area. With the implementation of measures, it is concluded that significant cumulative effects will not occur.

Irish Water - Arklow Waste Water Treatment Plan

The main aim of the proposed Arklow Town WwTP development is to collect and appropriately treat the wastewater generated in Arklow town (which currently discharges untreated wastewater to the Avoca River) such that the treated effluent complies with national and EU standards.

Interceptor sewers proposed along the North and South Quays in Arklow will intercept the existing wastewater flows and convey them to the proposed wastewater treatment plant (WwTP). The proposed location of the WwTP is at the Old Wallboard Site at Ferrybank, immediately adjacent to the North Quay (on the northern bank of the Avoca River) and the Irish Sea. The final treated effluent from the WwTP will discharge into the Irish Sea via a *ca.* 900m long outfall pipe with a diffuser section at its end.

The Arklow FRS development and the Arklow WwTP project overlap within the Avoca River and Estuary. There is potential that activities proposed for the schemes to result in cumulative effect to biological receptors.

With regard to potential cumulative effects, the activities proposed for the Arklow FRS development and the Arklow WwTP project of concern are those that have potential to result in:

- release of sediment and pollutants
- loss of terrestrial habitat and disturbance
- generation of noise

Release of sediment and pollutants

As outlined in **Section 10.5.4.1** above the activities of concern proposed for the construction and operational phases of the Arklow FRS development with regard to the release of sediment and chemical pollutants from machinery include construction, dredging (both capital and occasional channel dredging) and excavation operations associated with the installation/ removal of temporary river access points, haul roads and causeways and the annual removal of debris from the debris and silt traps will result in the release of sediment to the river adjacent to, and downstream of, the development site. There is also potential risk of run off of sediment and chemical pollutants from stock piles of excavated material and dredge material.

For the proposed Arklow WwTP project the main potential sources of releases of sediment and pollutants from machinery are construction activities occurring within the Avoca River channel including the construction of interceptor sewers along the North and South Quays and the construction and operation of temporary causeway and the storage/ transportation of excavated materials and construction materials. These activities all have the potential to give rise for silt, soil and chemical pollutants to enter into the Avoca River and estuary. In addition, there is potential that the unintentional release of bentonite used for drilling could contribute to levels of suspended material in the water column.

For the schemes, the biological receptors of concern with regard to the potential effect of the release of sediment and pollutants are fish (including diadromous species migrating through the area) and benthic habitats.

There is potential that increases in suspended sediments due to activities proposed for the schemes could effect the gills of fish including migratory fish species such as salmon and lamprey, resulting in injury or mortality. There is also potential that increases in suspended sediments could effect water turbidity reducing predation efficacy in visual feeders such as salmon.

There is potential that the schemes will result in run off of sediment, and hazardous and non-hazardous material from stockpiles of material, and the accidental release of hydrocarbons from plant machinery and fuel stocks.

Organic polymers or heavy metals associated with cementing/ concreting materials used for construction activities for the schemes are toxic to organisms in sufficient quantities and have the potential to contaminate the seabed sediments adjacent to the project, inhibiting recolonisation of the area after construction and or dredging.

For the Arklow FRS development a suite of mitigation measures have been identified to ensure likely significant effects to fish and benthic habitats from discharges do not occur. These mitigation measures are detailed in **Section 10.6** and the CEMP presented in **Appendix 5.1** below.

Consent to undertake the Arklow WwTP project is subject to the meeting of conditions that require that activities are undertaken to ensure significant impact associated with discharges do not occur.

Following the implementation of mitigation measures proposed for the Arklow FRS development and the consent conditions set for the Arklow WwTP project, significant cumulative environmental effects due to discharges will not occur whether the schemes are undertaken concurrently or consecutively. The mitigation measures and consent conditions include the implementation of seasonal restrictions of in-stream works and standard construction best practices.

It should be noted that increased water turbidity following dredging for the Arklow FRS development will not introduce significant amounts of sediment to the lower Avoca or nearby marine environment, as local water currents will result in the deposition of the majority of sediment near the dredging activity. Where sediment is deposited outside of the immediate dredge areas, any effects of deposition are not likely to be significant for the local sedimentary habitats and fauna, as the areas are naturally turbid (see above) and hydrodynamically active experiencing a high degree of natural suspended solids due to the current tidal regime and sedimentary nature of the area.

Loss of habitat and Disturbance

Birds

Tree felling, removal of scrub and other tall vegetation is required to accommodate the proposed Arklow FRS development and the Arklow WwTP project. In a number of instances, the areas to be impacted by the schemes are foraging, resting and roosting habitats for resident birds. For both schemes tree/landscape planting will be undertaken to address the loss of terrestrial habitat. For the proposed Arklow FRS the landscape design/public realm drawings (**Appendix 4.2**) provide details on the planting types and species proposed in addition to the identification of trees to be retained within the planning boundary. The detail of the tree/landscape planting proposed is detailed in **Section 10.6** while further details is provided in **Chapter 11** *Landscape and Visual*. The removal of all vegetation will be carried out between 1 September and 28 February, to avoid any risk to breeding birds and their habitats.

In addition to the tree/landscape planting described above, the proposed Arklow FRS and the Arklow WwTP project include the installation of nesting boxes at the Arklow Bridge to provide nesting habitat for the Red-listed species Grey Wagtail, and for Pied Wagtail that feed extensively along the river channel.

In addition to above mitigation, the Arklow FRS development also includes mitigation to avoid direct and indirect effects on bird behaviour due to the loss of in-river gravel beds and habitats.

Specifically, it is proposed to install three roosting platforms in the river channel upstream of Arklow Bridge and creation of riparian habitat. The details of the proposed mitigation is presented in **Section 10.6.**

Following the implementation of the mitigation measures described above for the schemes, significant cumulative environmental effects to birds due to habitat loss will not occur whether the schemes are undertaken concurrently or consecutively.

Bats

There is potential for disturbance, displacement, or habitat loss arising from the proposed schemes to affect bat species recorded during baseline surveys. The sources of effects common to the schemes relevant to bats are vegetation clearance and construction activities at Arklow Bridge. Given the potential for impacts, Bat Derogation Licences have been issued for schemes. Mitigation measures have been developed for the schemes to address potential effects. Mitigation measures proposed for the Arklow FRS development are detailed in **Section 10.6.5** below.

Following the implementation of the mitigation measures for the schemes significant cumulative environmental effects to bat will not occur whether the schemes are undertaken concurrently or consecutively.

Generation of noise

The Arklow WwTP project includes for a range of mitigation measures required to ensure no significant effect of the project to marine mammals in coastal and marine environments east of Arklow Harbour at South Quay.

Section 10.4.10.3 above has concluded that as the FRS development area does not represent an important foraging area for the marine mammals, it is highly unlikely to support significant number of marine mammal species and it is possible to rule out the potential for significant effects with regard to impact of noise on marine mammals. Consequently, it can be concluded here that significant cumulative environmental effects to marine mammal will not occur whether the schemes are undertaken concurrently or consecutively.

Sure Partners Site Investigations at Arklow Bank

Arklow Wind Park Project - SSE/ Sure Partners have proposed site investigations to inform the engineering and design of an offshore wind farm. The objectives of the site investigation are to gather geotechnical and wind resource information. The site investigation surveys proposed are:

1. Array Area Preliminary Site Investigation:

   a. Boreholes x 25 locations
   b. Cone Penetration Testing (CPT)'s x 40 locations
   c. Vibrocores (VC)'s or Grab samples x 30 locations
2. Cable Route Site Investigations:
   a. CPTs every 500m along each route
   b. VCs or Grab samples every 500m along each route
3. Floating LiDAR Deployment x 2 locations
4. Sediment Dynamic Measurements
   a. Benthic Flume x 9 locations
   b. Benthic Lander x 4 locations
5. Nearshore Landfall Site Investigation:
   a. Landfalls: Boreholes x 4 locations at each landfall
   b. CPT's x 8 locations at each landfall
   c. Trial Pits on the beach x 5 at each landfall
6. Arklow Harbour Site Investigation for O&M Base
   a. 6 x boreholes locations

Given the nature of the investigations proposed for the Arklow Wind Park Project the only impact mechanism associated with the Arklow FRS development that could result in cumulative effects is noise emissions from geotechnical survey proposed for 1, 2, 4, 5 and 6, (*i.e.* coring, borehole, trial pits excavation *etc*.).

Site investigations proposed for 1, 2, 4, and 5 are all located outside of the Arklow FRS development area in nearshore areas; given the location, nature and scale of the works there is no potential for cumulative effects with the Arklow FRS project.

Site investigations proposed for 6 are located in the harbour marina on the south shore immediately adjacent to works proposed at the marina for the Arklow FRS development area.

As outlined in **Section 10.5.4.3** the biological receptors of concern with regard impact of noise emissions are:

- Marine Mammals
- Fish
- Otter
- Bats

It was demonstrated that as the Arklow FRS development area is highly unlikely to support significant number of marine mammal species it is possible to rule out the potential for significant noise disturbance effects. Consequently, it is concluded that significant cumulative effects will not occur.

Given the hearing biology of the fish species and the fact that individual fish are unlikely to stay in the vicinity noise sources, significant adverse effects from injurious noise from construction noise and vibration are unlikely occur. The same remains true for the potential for injury at Arklow Harbour Site Investigation as a result of boring operations. Consequently, it is concluded that significant cumulative effects will not occur.

Otter have been recorded a significant distance upstream from the site of the proposed operations at harbour marina. Given this distance it is concluded that significant cumulative effects will not occur.

Underwater noise from the operations do not pose a risk to bats. Consequently, it is concluded that significant cumulative effects will not occur.

10.6 Mitigation Measures and Monitoring

10.6.1 Overview

The biological receptors identified for the provision of mitigation measures to ensure likely significant effects do not occur during the construction and operational phases of the proposed FRS development are listed below in **Table 10.15** alongside the associated Impact Mechanisms and a brief description of potential effects.

It should be noted that measures not specifically designed to address potential effect in the specific species groups listed here but that will be implemented as a matter of course during the Arklow FRS and to address potential effects associated with the Arklow WwTP project are also listed in the sections.

Proposed monitoring to be undertaken prior to and during work are briefly discussed in **Section 10.6.10** while mitigation to be implemented during scheme maintenance works are summarised in **Section 10.6.11**.

Table 10.15: Biological receptors requiring mitigation

Impact Mechanism	Biological Receptor	Summary of Potential Effects	For mitigation refer to:
Impact Mechanism 1 Discharges	Habitats SCI Bird Species Resident Bird Species	Potential for project discharges to contaminate habitats at the marsh and nearby river impacting resident flora and fauna, and inhibiting future recolonisation of the areas. Indirect effect of discharges on bird foraging success by reducing food availability.	**Section 10.6.2**
	Diadromous Fish Species	Diadromous species have evolved over geological time to migrate through estuaries on their way to spawning grounds and as many estuaries are naturally high in turbidity, these species evolved mechanisms to deal with high suspended sediment loads. Despite these mechanisms and the fact that the Avoca River is naturally turbid conditions there remains potential that dredging activity may result in effects to Lamprey, Salmon. Mitigation is required to reduce any potential effect of the dredging on migrating fish species	**Section 10.6.2.6**

Impact Mechanism	Biological Receptor	Summary of Potential Effects	For mitigation refer to:
Impact Mechanism 2 Loss of In-River Habitats Impact Mechanism 4 Loss of Habitat at Arklow Town Marsh pNHA	Resident Bird Species	In order to mitigate direct and indirect effects on bird's behaviour due to the loss of in-river gravel beds due to the river dredging works, it is proposed to install three roosting platforms in the river channel upstream of Arklow Bridge. Marsh habitats used by bird species for foraging, roosting and nesting will be lost due to works at SC1 and SC3, and the installation of the embankment.	**Section 10.6.4**
Impact Mechanism 3 Noise Disturbance	Bat Species	As all bat species recorded within the planning boundary of the proposed FRS development are protected under Annex IV of the Habitats Directive, the works to be carried out to the two southernmost arches of Arklow Bridge and their associated piers require the aforementioned derogation license from the NPWS to allow works that would create a risk to bats and would remove existing roosting options. The following measures were proposed as part of the application for the derogation license and will be implemented during construction to meet the requirements for protecting the bats availing of Arklow Bridge.	**Section 10.6.5**

10.6.2 Habitats and Flora

10.6.2.1 Habitats

The site preparation of the compounds will be as described in **Section 5.4.3** of **Chapter 5** *Construction Activities* of the EIAR.

For the duration of the construction period when SC1 is in use and during WP5, Arklow Marsh pNHA and the river area will be protected from runoff by the installation of a temporary low bund constructed of impermeable material. It will be situated along the western boundary and will redirect surface water run off towards siltation traps before discharge.

Dredge material will be managed in an area situated on the south eastern portion of SC1 behind Circle K filling station. A low bund will be installed around the area on top of geotextile membrane and hardcore material. A localised stormwater drainage system will be constructed within the area to convey runoff to a sedimentation collection system. The collection system will be periodically monitored during material testing. Run-off collected will be directed to a siltation trap before discharge.

These measures will ensure that the likelihood of impacts is low. SC1 will be planted as described below in the following section on completion of the permanent works and as shown in the landscape design and public realm drawings in **Appendix 4.2**.

The site preparation of SC2 will be as described in Section 5.4.3 of Chapter 5 Construction Activities of the EIAR. In summary, a suitable geotextile membrane will be placed over the existing ground and suitable hardcore material will be placed over the geotextile to form a trafficable surface. A low bund, comprising precast concrete traffic barriers or similar wrapped in an impermeable membrane, will be constructed around the perimeter of the site to retain the temporary surface and the dredged material. The temporary surface will be graded to allow any water from dredged material to flow to a shallow drain around the perimeter by which it will flow to a sump from where it will be pumped to a storage tank for collection by tanker for disposal. SC2 will be returned to its current condition by levelling and reseeding the grass area.

At SC3, suitable geotextile membrane will be placed over areas of soft ground and hardcore material will be placed over the site to form a trafficable surface. Surface water run-off at SC3, which is likely to contain sediment due to the movement of construction traffic through it to the river and to WP5 works, will be prevented from running into the adjacent Avoca River by the construction of a low bund along the river edge and the diversion of any runoff to a sump from where it can be discharged through a sedimentation tank. SC3 will be grassed as per the Drawing No 304 (Appendix 4.2).

At SC5 and SC6, a low bund, comprising precast concrete traffic barriers or similar, will be constructed around the perimeter of the site to retain the dredged material.

At SC6, a 5m buffer zone will be created between the working area and the *Equisetum Moorei* habitat through the construction of a low bund (approximately 0.5m high) and 1.5m high fence. The bund will prevent any runoff from the dredged material flowing into the habitat of the *Equisetum Moorei.*

SC5 and SC6 6 will be reinstated to their existing condition on completion of the permanent works.

The northern bank, upstream of Arklow Bridge, will be extended into the river channel for a length of c.75m and up to 12.0m in width. The realigned river bank will be formed using rip rap at the river bed level and inert dredge material and earth will be placed on top to match the levels of the existing river bank. The extended river bank will be landscaped with mixed native woodland trees. This area is referred to as Area No 1 on **Dwg 304** (**Appendix 4.2**) and will consist of: *Alnus glutinosa* (Black Alder), *Salix aurita, Salix cinerea oleifolia, Salix caprea, Salix petrandra* (Willow) and *Betula pubescens* (Downy Birch).

The increase in levels of sections of the river bank along River Walk and South Bank will provide some opportunities for riparian habitat creation and refuge areas to mitigate direct and indirect effects of the river dredging works on aquatic mammals and birds (Refer to (refer to D**rawing Nos. 1003, 1013 and 1016** in **Appendix 4.1**).

10.6.2.2 Planting

Tree/landscape planting will be undertaken to address the loss of terrestrial habitat to accommodate the FRS. The landscape design/public realm drawings (**Appendix 4.2**) provide details on the planting types and species proposed in addition to the identification of trees to be retained within the planning boundary. Further details are also provided in **Chapter 11** *Landscape and Visual*. The following details on the drawings are of particular relevance for habitat mitigation:

- **Dwg 300:** River Walk (South Bank) Planting proposed: Semi-mature tree species proposed include: *Acer platanoides* 'Columnare' (Norway Maple), *Betula pendula* (Birch), *Crataegus laevigata* 'Paul's Scarlet' (Hawthorn), *Pinus sylvestris* (Scot's Pine), *Prunus avium* 'Plena' (Double flowered Wild Cherry). Ornamental shrubs and perennials, amenity grass.
- **Dwgs 301, 302** and **303:** South Quay to Arklow Harbour (South Bank) - Planting proposed: Semi-mature tree species proposed include: *Acer platanoides* 'Columnare' (Norway Maple), *Ulmus* "Lobei" (Elm), *Prunus avium* 'Plena' (Double flowered Wild Cherry). Ornamental shrubs and perennials, amenity grass.
- The landscaping at Arklow Marsh (adjacent to the proposed embankment) and the extension to the north river bank upstream of Arklow Bridge will provide some opportunities for habitat creation and mitigation of direct and indirect effects on biodiversity due to the loss of in-river vegetated islands and loss of habitat in the marsh pNHA. Further details are provided below.
- Native Woodland planting (Area No 1) is proposed along the new extended north bank of the river (Refer to **Dwg 304**) and will consist of: *Alnus glutinosa* (Black Alder), *Salix aurita, Salix cinerea oleifolia, Salix caprea, Salix petrandra* (Willow) and *Betula pubescens* (Downy Birch).
- Irish Native species rich grass and wildflower mixture is proposed along the river side of the new floodwall on north bank (SC3) and along the length of the embankment (Refer to **Dwg 304, 305** and **306**).
- Native Woodland planting (Area No 2) is proposed along the east side of the embankment and in SC1 (Refer to **Dwg 304, 305** and **306**) and will consist of: *Alnus glutinosa* (Black Alder), *Salix spp.*(Willow) and *Betula pubescens* (Downy Birch), *Prunus spinosa* (Blackthorn), *Crataegus monogyna* (Hawthorn) and *Viburnum opulus* (Guelder Rose).
- Upon completion of the works, in-stream (aquatic) vegetation will be allowed to re-colonise naturally, however, this will be monitored and if deemed necessary additional planting of suitable aquatic plant species will be undertaken.
- Upon completion of the works any other grassland areas disturbed during the construction works, will be re-sown with an appropriate species-rich grass and/or native wildflower seed mix option (refer to planting detail above and landscape drawings in **Appendix 4.1**).

10.6.2.3 Tree Removal

The plans for tree removal for construction of the proposed scheme are shown in the landscape drawings in **Appendix 4.2**. Tree removal is also described in **Chapter 12** *Landscape and Visual*.

Mitigation measures for bats during tree felling are described in **Section 10.6.7** below.

10.6.2.4 Bryophytes

As noted previously in **Section 10.4.5.7**, it is considered that the bridge does not support a bryophyte flora of conservation interest. However, it does support moderate to high bryophyte cover in some areas (*e.g.* the top concrete).

Bryophyte cover on the bridge be retained where possible. Where bryophytes do need to be removed from a surface, the surface shall be replaced with similar material and the use of very smooth surfaces will be avoided where possible. Urban and aquatic bryophytes tend to quickly re-colonise surfaces as long as there is some texture to the surface.

10.6.2.5 Non-native Invasive Species

As outlined in **Section 10.4.5** invasive alien plant species have been identified and documented within the proposed works areas. Construction (and potentially operational maintenance works) could potentially disturb stands of invasive plants and/or soils contaminated with invasive plant material. In addition to lands within the proposed works areas, there is an identified risk of invasive plant species being spread onto neighbouring lands and onto public roads and other locations. The invasive plant species which have been identified in the proposed works areas include Butterfly-bush (*Buddleia davidii*), and Rhododendron (*Rhododendron ponticum*). Outside of the planning boundary along the Avoca River, Himalayan balsam (*Impatiens glandulifera*) and Japanese Knotweed (*Fallopia japonica*) have both been previously recorded.

A strategy to manage and prevent the spread of the invasive plants is outlined in the Invasive Alien Plant Species Management Plan of the CEMP in **Appendix 5.1** of **Chapter 5** *Construction Strategy.* The management plan includes specific mitigation measures regarding the eradication and biosecurity procedures to protect the habitats and fauna. The management plan also details the careful application of herbicide to treat these species.

Prior to commencement, all works areas, site compounds and access routes will be re-surveyed for non-native plant species to ensure that new infestations have not been established. If found, appropriate mitigation strategies will need to be devised and implemented. Monitoring for re-emergence of non-native invasive species will be undertaken by the Contractor's Ecologist or a suitably qualified Ecologist.

10.6.2.6 Use of Herbicide at Arklow Bridge

Specific mitigation measures regarding the careful application of herbicide to remove woody vegetation in the bridge during WP1 are presented the CORA report in **Appendix 11.8** of **Chapter 11** *Archaeological, Architectural and Cultural Heritage.*

10.6.3 Diadromous Fish Species

It shall be a requirement of the Contract that the CEMP will provide the minimum requirements that the Contractor will be required to implement.

The Contractor shall submit a detailed programme of work to the client and to Inland Fisheries Ireland showing the order of procedure and the method by which it is proposed to carry out the authorised works, together with a timetable for completion of such work. These works shall comply with the IFI guidance.

The seasonal restrictions contained in the guidance has been modified in consultation with Inland Fisheries Ireland, in respect of the proposed scheme, to take account of the presence and seasonal passage on migration of Habitats Directive Annex II listed fish species Atlantic Salmon, River Lamprey, and potentially also Sea Lamprey in the Avoca River and Estuary. All instream works including the installation and removal of sheet piling or geotextile wrapped gabions required to provide barriers between works areas /temporary haul roads and aquatic habitats will be carried out during the five months of May to September inclusive.

The following mitigation measures will apply:

- Four weeks' notice shall be given in writing to the Employer's Representative and Inland Fisheries Ireland before the authorised works commence;
- To further reduce any potential effect of the dredging on migrating fish species *e.g.* Lamprey and Salmon, dredging shall not be carried out between October to April.
- A suitably qualified Environmental Clerk of Works shall be appointed to oversee and monitor all measures taken to protect the aquatic environment;
- The Contractor shall pay all statutory fees associated with the works;
- The Contractor shall be responsible for maintaining flows in the river at all times. The Contractor will be permitted to construct temporary haul roads in the river however the flow must be maintained throughout this period to enable free passage of fish. The details of the all temporary works in and immediately adjoining the Avoca River shall be subject to approval by the Employer's Representative and by Inland Fisheries Ireland;
- The Contractor shall take all practicable measures to prevent the deposition of silt or other material in, and the pollution or damage to the Avoca River;
- Any construction equipment and vehicle which in the opinion of the
- Employer's Representative presents a risk of affecting the Avoca River shall be removed from Site;

- Instream machine works shall be minimised, and any machines working in the watercourse must be protected against leakage or spillage of fuels, oils, greases and hydraulic fuels;
- Instream earthworks must be executed so as to minimise the suspension of solids. Construction works, especially ones involving the pouring of concrete, must be conducted in the dry;
- De-watering of any in-stream or marine sheet piled areas will be via a screened water intake pipe, to avoid injury or mortality to any fish that may be present;
- Search for and safe removal to safe waters of any fish trapped in enclosed works areas in the aquatic environment will be carried out by suitably qualified and licenced personnel, using methodologies to be agreed with Inland Fisheries Ireland (e.g. electrofishing);
- Discharge from the dewatering process will be passed to a suitably sized settlement tank or a propriety silt removal system, before discharge to the Avoca River or the local sewer network. Back-up equipment will be required to be maintained ready for use at all works sites.;
- In order to minimise the volumes of water required to be removed from contained works areas in which in-situ cement works and/or excavation are required, works areas will be covered overnight and other periods when works are not in progress, in order to minimise infiltration of rainfall into works areas;
- To minimise the risk of spills and/or leaks, standard good practice will be followed with regard to pollution prevention as part of the appointed Contractor's detailed CEMP(s);
- All in-situ cement works will be monitored by the appointed contractor's Environmental Manager to ensure that spill prevention and remediation measures are in place, to minimise the risk and extent of spills and to rapidly deploy clean up equipment;
- Machinery maintenance work, re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles / equipment will take place in designated bunded areas within the temporary construction compounds. All waste oil, empty oil containers and other hazardous wastes will be disposed of in compliance with the requirements of the Waste Management Acts 1996, as amended. All of the construction machinery operating near any watercourse will be systematically checked in order to avoid leaks of oils, hydraulic fluids and fuels; and
- Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment.

Every effort will be made to prevent pollution incidents associated with spills during the construction of the proposed scheme. The risk of oil/fuel spillages and leaks will exist on the site and any such incidents will require an emergency response procedure. The following steps provide the procedure to be followed in the event of an oil/fuel spill occurring on site:

- Identify and stop the source of the spill/leak and alert people working in the vicinity;
- Notify the Environmental Manager immediately giving information on the location, type and extent of the spill/leak so that they can take appropriate action;
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident;
- Contain the spill/leak using the spill control materials, track mats or other material as required. Do not spread or flush away the spill/leak;
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses and/or sensitive habitats;
- If possible, clean up as much as possible using the spill control materials;
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited;
- The Environmental Manager shall inspect the site as soon as practicable and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring; and
- The Environmental Manager will notify the appropriate stakeholders such as WCC, National Parks and Wildlife Service, Department of Communications, Climate Action and Environment and Department of Housing, Planning and Local Government and/or the EPA.

10.6.4 Resident Bird Species

The proposed planting as described in **Section 10.6.2** above will mitigate the loss of terrestrial habitat for birds, in particular in the Arklow town marsh pNHA (Refer to **Dwg 304, 305** and **306** in **Appendix 4.2**).

The proposed river dredging will remove the in-river gravel banks. It is proposed to replace the habitat provided by these sandbanks through the use of three manmade roosting platforms (floating islands) (8m x 5m each). These will be low platforms with timber edges and finished in a layer of gravel and will provide roosting areas for birds at all tides. These will be anchored to the bed of the river, upstream of Arklow Bridge, with concrete anchor blocks and chains.

The proposed installation of these three roosting platforms in the river channel upstream of Arklow Bridge will provide for some mitigation of direct and indirect effects on birds due to the loss of in-river gravel beds due to the river dredging works (Refer to **Dwg 304** and **301 in Appendix 4.2**, refer also to **Dwg 1003** in **Appendix 4.1**). Refer also to Figures 12.5.2 and 12.7.2 photomontages (which show the proposed roosting platforms) of **Appendix 12.1** of **Chapter 12** *Landscape and Visual.*

The increase in levels of sections of the river bank along River Walk and South Bank will provide some opportunities for riparian habitat creation and refuge areas to mitigate direct and indirect effects of the river dredging works on aquatic mammals and birds (Refer to Dwg **1003, 1013** and **1016** in **Appendix 4.1**).

In addition, new riparian habitat will be created along the northern bank (see **Section 10.6.9** above) to mitigate direct and indirect effects of the river dredging works on birds.

All vegetation clearance works and site preparatory works will be conducted outside of the bird nesting season (March to August inclusive). If this is not possible, a breeding bird survey will be undertaken by a suitably qualified ecologist in advance of the works to ensure that there will be no impacts on nesting birds. If nests are found, they will be safeguarded, with an appropriate buffer, until the chicks have successfully fledged.

In addition, nesting boxes for the Red-listed species Grey wagtail and for Pied wagtail will be provided in alternate arches of Arklow Bridge, on ledges above high water level in the existing concrete structure on the upstream side of the bridge, in order to provide nesting habitat for these species that feed extensively along the river channel. The nest boxes designs will be suitable for use beneath bridges. The Contractor will be required to consult with a suitably qualified ecologist in the design and installation of the nest boxes.

10.6.5 Bat Species

A Derogation Licence for the Arklow FRS has been issued. Refer to the specific mitigation measures detailed in **Appendix 10.3** of this EIAR and as detailed below.

As all bat species recorded within the planning boundary of the proposed scheme are protected under Annex IV of the Habitats Directive, the works to be carried out to Arklow Bridge will require a derogation from the National Parks and Wildlife Service of the Department of Culture, Heritage and the Gaeltacht to allow works that will create a risk to bats and will remove existing roosting options. The measures proposed will meet the requirements for protecting the bats availing of Arklow Bridge.

The measures proposed specifically for the two southernmost arches of Arklow Bridge derogation include:

- Examination of the bridge prior to works by the licensed bat specialist for evidence of bats.
- Exclusion of bats if necessary with one-way valves devised by the bat specialist.
- Capture of any bats that are still present prior to works and retention until the risk of injury or re-entry to the bridge has been removed.

To ensure that there is no possibility of direct disruption to a summer roost during repairs, the following is proposed:

- The roost on the southern side of the bridge will be excluded during the autumn / early winter season (2021) before construction commences during summer 2022 under the bridge.
- 3 bat boxes will be temporarily installed on the northern side of the bridge as an interim measure to mitigate for the loss of roost (in the period summer/autumn 2021).
- Once the works on the southern side are complete, bat boxes shall be installed on the southern side.
- If bats are using the interim bat boxes on the northern side, these will need to be excluded before works are carried out on the northern side.
- Provision of 4 x 2FR Schwegler woodcrete bat tubes for each arch of three arches at the northern end and 3 arches at the southern end where works are undertaken (i.e. 24 x 2FR bat tubes). These bat boxes must be attached to the bridge in an unlit area above high-water mark. Refer to Drawing No 1005 of Appendix 4.1 of the EIAR which shows the location of the bat tubes on the bridge,
- Provision of additional bat boxes in the flood walls. It is proposed that 6 Schwegler 1FR bat tubes will be incorporated into the flood walls on the southern section of the project (Refer to Drawing Nos 1036, 1039, 1040 and 1041 of Appendix 4.1 of the EIAR which shows the location of the bat tubes in the walls,). 13 x 1FR bat tubes shall be incorporated in the concrete piers of the proposed debris trap which will be located across the river channel upstream of Arklow Bridge (Refer to Drawing Nos 1021 of Appendix 4.1 of the EIAR which shows the location of the bat tubes in the concrete piers).
- This shall be achieved in two phases: Works to southern half of the bridge in the first year requires that only the three bat tubes are installed in the first year of works. Works to the northern half of the bridge in the third year requires that the bat boxes for the southern section of the bridge are installed for the third year of repair work. Provision of 4 x 2FR Schwegler woodcrete bat tubes for each arch of three arches at the northern end and 3 arches at the southern end where works are undertaken (i.e. 24 x 2FR bat tubes). These bat tubes must be attached to the bridge in an unlit area above high-water mark. All remaining shall be installed once all works liable to disturb or damage them has been completed.

Monitoring of bat boxes is described in **Section 10.6.10** below.

<u>Examination of all mature trees, and bat boxes along River Walk with roost potential prior to removal</u>

All mature trees along River Walk along the South Quay and in the works area for work package 5 in Arklow Marsh shall be examined for bats prior to felling.

This may be achieved through a bat detector assessment if undertaken in the active season (prior to November and after March) or alternatively may require supervision at the time of felling. Any mature trees will require survey prior to felling.

Lighting at the site compounds

External lighting will be installed around the contractor's compounds for the safety and security of staff on the site. The lighting will be kept close to the buildings and only operate when there is movement. The lighting will be designed in consultation with the licenced bat expert, using emerging lighting technologies and having regard to best practice.

Mitigation for bats includes the following additional lighting considerations:

- Floodlights will be LED, as these have glass lenses which can be used to direct the light to the working area and reduce light spillage;
- Floodlights for working areas will make use of multiple lights to produce a more uniform light output and to lower the individual output from a single source – these will however still be quite high output;
- The site lighting incorporates the use of street lights to light the roadway around the building. The street lights will be selected to minimize upward lighting spill, hoods, louvres, shields or cowls will be fitted on the lights to reduce light spillage, and will incorporate the use of presence detection;
- Perimeter fence lighting will also incorporate presence detection, and will be off by default until motion is detected;
- Low level (~ 1m high) bollard lighting is being used in selected areas (refer to architect's landscape plans);
- Lights will be of low intensity. It is better to use several low intensity lights than one strong light spilling light across the entire area. The source of light will be Light Emitting Diodes (LEDs) as this is a narrow beam highly directional highly energy efficient light source. They shall allow for a light level of 3 lux at ground level. This low lighting is thus easier to control both the direction but also the actual light level because it is so close to the target area (if using bollard lighting);
- Narrow spectrum lighting shall be used with a low UV component. Glass also helps reduce the UV component emitted by lights.

In the event of security lighting being required, it is recommended that infra-red lighting and infra-red cameras are employed to record anti-social activity to assist in crime solving and prevention. This will not raise the visible light levels that will affect mammals and birds to a much greater extent.

10.6.6 Otter

As noted above in **Section 10.4.10.4**, whilst otter holts were not identified during the walkover surveys within the planning boundary, otter have been observed using the river in the Arklow area and it is likely that the vegetation at the banks of the Arklow Town pNHA may provide suitable habitat for the species. Although, habitat surveys undertaken at the pNHA also did not report evidence of otter runs or slides in the area. Therefore, prior to commencement of works, a survey to identify the presence of any new Otter resting places/holts within 200m of the works areas will be undertaken.

If found and likely to be damaged/disturbed by the works, a derogation licence shall be applied for from NPWS. This licence will include otter resting places and holts identified during the pre-construction survey. Any further mitigation measures required by the derogation licence shall be implemented.

The increase in levels of sections of the river bank along River Walk and South Bank will provide some opportunities for riparian habitat creation and refuge areas to mitigate direct and indirect effects of the river dredging works on aquatic mammals such as otter.

To minimise the potential for otters becoming trapped, all excavations will be left open for the minimum possible time, and not over-night. If excavations have to be left open over-night, they will be fitted with an escape ramp (no more than 45°) to allow accidentally trapped animals to escape.

Materials to cover excavations or create escape ramps will be on site at all times so that all excavation areas can be made safe before leaving site.

All materials stored on site will be stacked securely so as to prevent accidental collapse if investigated by an Otter, or any other large mammals.

10.6.7 Badger

In order to mitigate construction impacts on Badger potentially commuting and foraging in the works area the following mitigation measures will be implemented:

- To minimise the potential for Badgers becoming trapped, all excavations will be left open for the minimum possible time, and not over-night. If excavations have to be left open over-night, they will be fitted with an escape ramp (no more than 45°) to allow accidentally trapped animals to escape. Materials to cover excavations or create escape ramps will be on site at all times so that all excavation areas can be made safe before leaving site.
- All materials stored on site will be stacked securely so as to prevent accidental collapse if investigated by Badger, or any other large mammals.
- Prior to commencement, all works areas, site compounds and access routes will be re-surveyed to ensure that new Badger setts have not been established. If found, appropriate mitigation strategies will need to be devised and implemented. This can be coupled with the survey for otter activity.

10.6.8 Pollution Prevention Measures

In addition to the measures proposed in **Chapter 14** *Water*, the following measures will be implemented to ensure that the water quality of the Avoca River is not adversely affected through pollution incidents and silt mobilisation. This mitigation will include:

- Appropriate sediment control measures will be employed.
- Any chemical, fuel and oil stores will be located on an impervious base within a secured bund with a storage capacity 110% of the stored volume.
- Biodegradable oils and fuels will be used where possible.
- Drip trays will be placed underneath any standing machinery to prevent pollution by oil/fuel leaks. Where practicable, refuelling of vehicles and machinery will be carried out on an impermeable surface in one designated area well away from any watercourse or drainage (at least 10m).
- Emergency spill kits will be available on site and staff trained in their use.
- Operators will check their vehicles on a daily basis before starting work to confirm the absence of leakages. Any leakages will be reported immediately.
- Daily checks will be carried out and records kept on a weekly basis and any items that have been repaired/replaced/rejected noted and recorded.
- Any items of plant machinery found to be defective will be removed from site immediately or positioned in a place of safety until such time that it can be removed. All items of plant will be checked prior to use before each shift for signs of wear/damage.
- All washing out of grout pumps will be carried out in designated areas away from the river, such as in the lined compound area. At no point will grout pumps be washed out at the worksite.

The procedure for excavating the hazardous and non-hazardous contaminated dredge material along the south bank upstream of Arklow Bridge will be as described in **Chapter 5** *Construction Activities*. This will include

- the installation of a temporary bund made up of impermeable material, approximately 500mm above high tide level will be constructed around the location.
- Dewatering, following removal of any fish for visibility of the riverbed and to enable the contractor to carry out the excavation process, will be required.
- The excavated contaminated dredge material will be transferred onto watertight trucks for transfer to SC2 for archaeological testing and monitoring or transported directly offsite.
- This material will be disposed offsite to an approved hazardous licenced facility or a non-hazardous licenced landfill as appropriate.

10.6.9 Enhancement Work

As detailed in the relevant sections above, planting is proposed as part of the outlined mitigation measures to replace lost habitat. The landscape design/public realm drawings (Appendix 4.2) provide details on the planting types and species proposed in addition to the identification of trees to be retained within the planning boundary.

As part of this mitigation, it is intended that the tree and grassland planting will be embraced by the Council and OPW to fulfil not only the mitigation function for habitat loss for bat and other species, but to uphold our national Policy for 'No Net Loss' as outlined in the National Biodiversity Action Plan 2017 -2021.

Action 1.1.3 of the National Biodiversity Action Plan 2017 -2021 states that 'All Public Authorities and private sector bodies will move towards no net loss of biodiversity through strategies, planning, mitigation measures, appropriate offsetting and/or investment in Blue-Green infrastructure. This will help ensure not only the 'no net loss' principal is upheld but that some enhancement effort is made to reverse the direction of biodiversity loss and carbon deficit overall.

To this effect, the planting plan has been designed with this in mind. One area of obvious biodiversity opportunity is the north bank and marsh area. Specific grass and native tree planting has been proposed in this location (Refer to **Section 10.6.2.1** above). In addition some of the grassed areas will be planted with a pollinator-friendly rich seed mixes. These areas can be adapted to be populated by a suitably biodiverse plant assemblage using a pollinator-friendly rich seed mix, adapted to the soil type present. The Irish based company Design by Nature can supply and provide advice on various wildflower mixes suitable for a range of pollinators local to the area.

The creation of pollinator friendly grasslands will be considered wherever possible throughout the scheme and wherever areas require re-seeding, a bee-friendly grass /wildflower seed mix will be used.

The landscaping at Arklow Marsh (adjacent to the proposed embankment) and the extension to the north river bank upstream of Arklow Bridge will provide some opportunities for habitat creation and mitigation of direct and indirect effects on biodiversity due to the loss of in-river vegetated islands and loss of habitat in the marsh.

The increase in levels of sections of the river bank along River Walk and South Bank will provide some opportunities for riparian habitat creation and refuge areas to mitigate direct and indirect effects of the river dredging works on aquatic mammals such as otter.

The proposed installation of three roosting platforms in the river channel upstream of Arklow Bridge will provide for some mitigation of direct and indirect effects on birds due to the loss of in-river gravel beds due to the river dredging works.

Bat boxes and bat tubes will be permanently installed in the arches of Arklow Bridge (upstream side), in the flood walls and in the RC columns of the debris trap to mitigate direct and indirect effects on bats due to the construction works at Arklow Bridge.

10.6.10 Establishing Up-to-date Baseline and Future Monitoring

Prior to any work commencing both aquatic and terrestrial biological surveys shall be carried out throughout the area including at the six site compounds to establish a pre-construction baseline.

Aquatic surveys shall include sampling the river bed upstream and downstream of the bridge and at the site of the proposed gravel and branch trap to record numbers of species and numbers of individuals of invertebrates and also to document sediment chemistry conditions including granulometry, organic carbon and depth of the REDOX layer.

Terrestrial surveys shall be designed to re-map plant communities and habitats throughout the work area. A survey of SC6 shall be undertaken in the summer months of 2021 to determine if *E.*x *moorei* is present or not.

All areas of the banks of the Avoca River that will be affected by the proposed plan shall be walked over to ensure that no otter holts or badger setts are present.

A monthly survey of water quality at a number of locations in the Avoca River, the Avoca Estuary and the Arklow Marsh shall be established if possible a year in advance of construction to establish levels of suspended solids, dissolved oxygen and salinity. Additionally, direct recording current meters and tide gauges shall be deployed upstream and downstream of the Arklow Bridge to record flow directions and velocities and pressure.

Monitoring for re-emergence of non-native invasive species will be undertaken by the Contractor's Ecologist or a suitably qualified Ecologist. Any new sighting will be reported the Employer's Representative during the construction phase and Wicklow County Council post construction and recommendations for treatment and eradication proposed.

Acceptance of boxes/tubes by bats can be less predictable than those for birds. Therefore, it is essential to monitor their use over a period of time. Those boxes/tubes that remain unused within two years of date of erection will be re-located. Bat boxes will also be checked in wintertime for general wear and tear and to remove droppings from the previous summer use.

Bat boxes will be inspected, by bat licence holder (bat specialist), at least once within 12 months of erection at appropriate season in order to monitor bat use and the species using boxes. This will be followed up with another inspection within 24 months of setting up. At this point, any bat boxes not used will be relocated to a new site. Any bats found will be counted and identified to species level. All data collected will be submitted to Bat Conservation Ireland.

Additionally, the bat box scheme will be registered with Bat Conservation Ireland and monitoring to be undertaken annually for 2 years.

10.6.11 Maintenance of the Scheme

The scope and nature of maintenance works for the proposed scheme is detailed in Chapter 4, however at this time the exact locations and frequency of maintenance activities are unknown.

Maintenance works (such as the gravel and debris traps and occasional channel dredging) which require in-stream works will follow the same mitigation measures for the protection of biodiversity and water quality set out above for construction stage.

Tree removal shall be limited to the removal of fallen trees or overhanging branches, unless identified as dead of diseased trees that are a risk of blockage. Tree roots shall not be removed from the river bank.

If a derogation licence is required for maintenance works, e.g. otter and bats, this shall be acquired prior to the decision to progress with the maintenance activities. Any further mitigation measures required by the derogation licence shall also be implemented during the channel maintenance activities.

10.7 Residual Effects

10.7.1 Habitats and Flora

With the implementation of the mitigation measures specified in **Section 10.6.4**, and from the considerations given in **Section 10.5.4.1** residual effects on habitats and flora, are assessed as not significant during construction and operation.

10.7.2 Diadromous Fish Species

With the implementation of mitigation measures included in **Section 10.6**, and from the considerations given in **Section 10.5.4.1**, residual effects on diadromous fish from construction and operation are assessed as not significant. No likely significant direct residual effects will arise diadromous fish from discharges during construction and operation.

10.7.3 Resident Bird Species

With the implementation of the mitigation measures specified in **Section 10.6.4**, and from the considerations given in **Section 10.5.4.1**, residual *in situ* effects on the resident bird species, are assessed as not significant during construction and operation.

10.7.4 Otter and Badger

With the implementation of the mitigation measures specified in **Section 10.6.4**, residual effects on resident otter and badger, are assessed as not significant during construction and operation.

10.7.5 Bat Species

With the implementation of the mitigation measures specified in **Section 10.6.5**, residual effects on species including Habitats Directive Annex IV listed bat species (Common pipistrelle, Soprano pipistrelle, Leisler's bat and Daubenton's bat), are assessed as not significant during construction and operation.

10.8 References

ARUP, 2018. Arklow Wastewater Treatment Plant Project. Natura Impact Statement.

CFRB. 2009. Avoca Estuary. Sampling fish for the WFD - Transitional Waters, 2008. 6 pps.

Chapman, C.J. and Hawkins, A.D., 1969. The Importance of Sound in Fish Behaviour in Relation to Capture by Trawls. FAO Fish Report 62, 717 - 729

Curtis, T. and Wilson, F. 2007. Wicklow Rare/Threatened and Scarce Plant Survey 2007. Equisetum x moorei. National Parks and Wildlife Service.

EPA, 2020. River Quality Surveys: Biological, p.6, Avoca.

ERBD 2008. Eastern River Basin District – Draft River Basin Management Plan.

Fossitt, J. 2000. A guide to habitats in Ireland. Heritage Council. 120 pps.

Gallagher, V and O'Connor, P. 1999. The Avoca Mine site. Proceedings of the Royal Irish Academy, 99: 43 – 57.

Inland Fisheries Ireland 2012. Sampling fish for the Water Framework Directive. Rivers 2011. 69 pps.

Inland Fisheries Ireland. 2017. National Programme: Habitats Directive and Red Data Book Species. Summary Report. 95 pps.

Kostyuchenco, L.P. 1971. The Effects of elastic waves generated in marine seismic prospecting on fish eggs in the Black Sea. Hydrobiological Journal, 9:45 – 48.

Lawton,C., Hanniffy, R., Molloy, V., Guilfoyle, C., Stinson, M. and Reilly, E. 2019. All-Ireland Squirrel

and Pine Maren Survey, 2019. Irish Wildlife Manual no. 121. 31 pps.

McMahon, T. and Quirke, J. 1992. Chemical observations in the water column and sediments of Galway Bay and the Shannon Estuary. Proceedings of the 1989 Lough Beltra workshop. Pps 43 – 49. Fisheries Research Centre, Abbotstown, Dublin.

NPWS.2011. Slaney River SAC Site Synopsis (site code 000781).

O'Reilly, P. 2009. The rivers of Ireland. Merlin Unwin Books.404 pps.

Popper, A.N. 2005. A review of hearing by sturgeon and lamprey. Prepared for U.S. Army Corps of Engineers by Environmental Bioacoustics LLC.

Walsh, N., Neill, M. and Lucey, J. 2012. River sediment studies in relation to juvenile pearl mussels and salmonids. EPA, 74 pps.

Wilson, F., Crushell, P. Curtis, T. & Foss, P.J. 2012. The County Wicklow Wetland Survey II. Report prepared for Wicklow County Council and The Heritage Council.

Yau, H. and Gray, N.F. 2005. Riverine sediment metal concentrations of the Avoca-Avonmore catchment, South East Ireland: a baseline assessment. Proceedings of the Royal Irish Academy, 105B: 95-106.

Appendix 10.1

Addendum to (February 2021) and Report on Habitat Survey for Equisetum x moorei at Site Compound 6

Addendum to
Habitat Survey for *Equisetum x moorei* at Site Compound 6

Produced by

AQUAFACT International Services Ltd

On behalf of

ARUP

February, 2021

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Update February 2021:

Curtis and Wilson (2007[1]) recorded *Equisetum* x *moorei* (*Equisetum hyemale* x *ramosissimum*) at Site Compound 6 (SC6) in July 2007.

The walkover survey undertaken at SC6 in December 2020 did not identify *Equisetum* x *moorei* at the site. This could be because the plant has gone from the site or that due to the time of year, it has died back. In order to verify this, a site visit in mid-May 2021 is recommended to see if the plant is present.

Following the publication of the December 2020 survey report, the boundary of SC6 was reduced to avoid directly impacting on the area where *Equisetum x moorei* was recorded in 2007.

[1] Curtis, T. and Wilson, F. 2007. Wicklow Rare/Threatened and Scarce Plant Survey 2007. Equisetum x moorei. National Parks and Wildlife Service.

Habitat Survey for *Equisetum x moorei* at Site Compound 6

Produced by

AQUAFACT International Services Ltd

On behalf of

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December, 2020

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Introduction

One of the areas, Site Compound 6 (SC6) with a total area (ex. carparks) of *ca* 8,500m², that has been identified as a site at which dredge material from the proposed deepening of the Avoca River upstream of the bridge in Arklow is to be stored for later examination archaeological remains is located to the south of the mouth of the Avoca River (see Figure 1).

Figure 1. Site Compound 6 at Arklow marked in brown.

It is a relatively narrow strip of land that includes 2 car parks, an access road and some amenity grassland. It is also a site where *Equisetum* x *moorei* (*Equisetum hyemale* x *ramosissimum*) was recorded by Curtis and Wilson in July 2007. This plant is on the only Horsetail on the Flora Protection Order and this affords the plant a high level of protection. It is illegal to cut, uproot or damage this species in any way, or to offer it for sale. This prohibition extends to the taking or sale of seed. In addition, it is illegal to alter, damage or interfere in any way with its habitat. This protection applies wherever the plant is found.

The site description given in this note is as follows:

"*This population occurs in modified dune habitat which lies between the road linking Arklow Town to Arklow Rock and the road linking the 2 car parks just behind the south beach at Arklow. The sand hills here lie just to the south of the Qualceram plc factory and in the depression in the dunes to the south and to the west of beach road the species is found."*(*sic.).*

The population at the time was estimated at between 200 – 300 plants.

Site visit results.

The site was visited on 17th December to see if this species was present. The "depression" where Curtis and Wilson recorded *E.* x. *moorei* is shown in Figure 2 below marked in grey. Its area is estimated at 700m² which is slightly less than 10% of the total area of SC6.

This area was walked over for *ca* 1 hour but no Horsetail of any species was recorded. This could be because the plant has gone from the site or that due to the time of year, it has died back. In order to verify this, a site visit in mid-May 2021 is recommended to see if the plant is present.

Figure 2. Area of depressed ground (marked in grey) at Site Compound 6 where Curtis and Wilson recorded *E.* x. *moorei.*

There was a population of *E. telmateia* recorded along the bank at the back of the larger carpark (see Photo. 1 below).

Photo. 1. *Equisetum telmateia* on the bank at the back of the carpark.

Management options

As *E.* x *moorei* is covered by the Flora Protection Order, it is recommended that Dr. Wyse Jackson of the National Parks and Wildlife Service who deals with rare, threatened or scarce plant species be contacted in order to discuss any potential methods of dealing with the plant.

It is possible that a licence to move the plant if the May site visit proves that it is present at the site. This would require to identification and possible purchase of suitable habitat away from SC6 to where the plant could be moved.

A simpler option would be if it **is** found in the May 2021 survey that the area where it is found growing would be fenced off and not be used for dredge disposal. The area would also need to be protected from dust blow that might arise during the drying out process of the dredge spoil.

Furthermore, any leachate arising from locations where dredge spoil is disposed off must not be let enter the protected area.

References

Curtis, T. and Wilson, F. 2007. Wicklow Rare/Threatened and Scarce Plant Survey 2007. *Equisetum* x *moorei.* National Parks and Wildlife Service.

Appendix 10.2

Bat Survey Report (2017)

(Appendix 11.4 of Arklow WwTP EIAR)

Bat Survey Report

Figure 1. Bat activity along the Avoca River close to the M11 Bridge in August 2017

Legend:

Blue circle = Soprano pipistrelle Green circle=Common pipistrelle

Black circle = Daubenton's bat

Figure 2. Bat activity along the south bank of the Avoca River October 17th 2016.

The orange track shows the survey route.

Green circles = common pipistrelles, Blue paddle = soprano pipistrelle, Purple paddle = pipistrelles and Daubenton's, "D" = Daubenton's, P = 2 pipistrelle species * indicates pre-dawn bat signals

Figure 3. Bat activity to the north of the Avoca River October 19th 2016

The majority of signals are shown as blue circles and represent soprano pipistrelles

Green paddle = Common pipistrelle "D" = Daubenton's P = 2 pipistrelle species at the same time

1. Bat activity in August 2017 along the Avoca River from the Alps to Arklow Bridge. Each flag denotes a recording for an individual bat at the time indicated by the last four-digit number

2. Close-up nearer to the Alps along the Avoca River

3. Northern end of Arklow Bridge; Blue circle = Soprano pipistrelle, Green circle = Common pipistrelle

Figure 4. Bat activity from the Alps to Arklow Bridge in August 2017

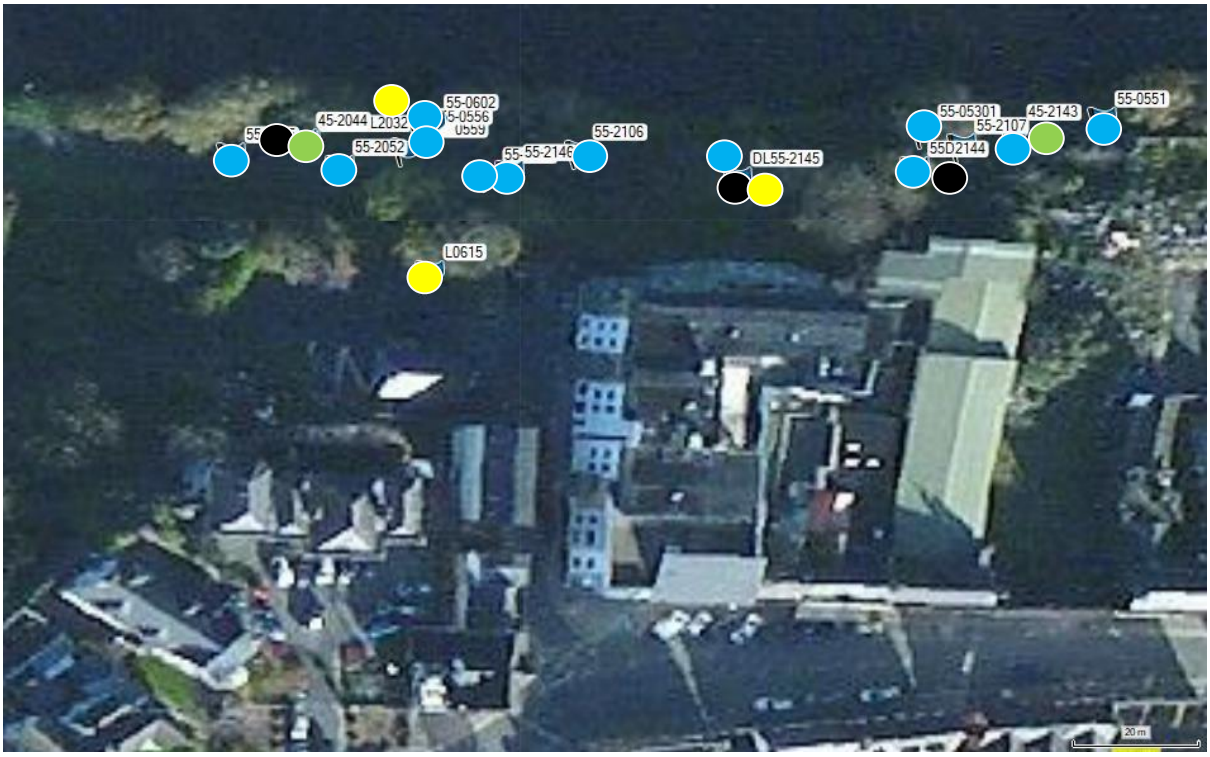
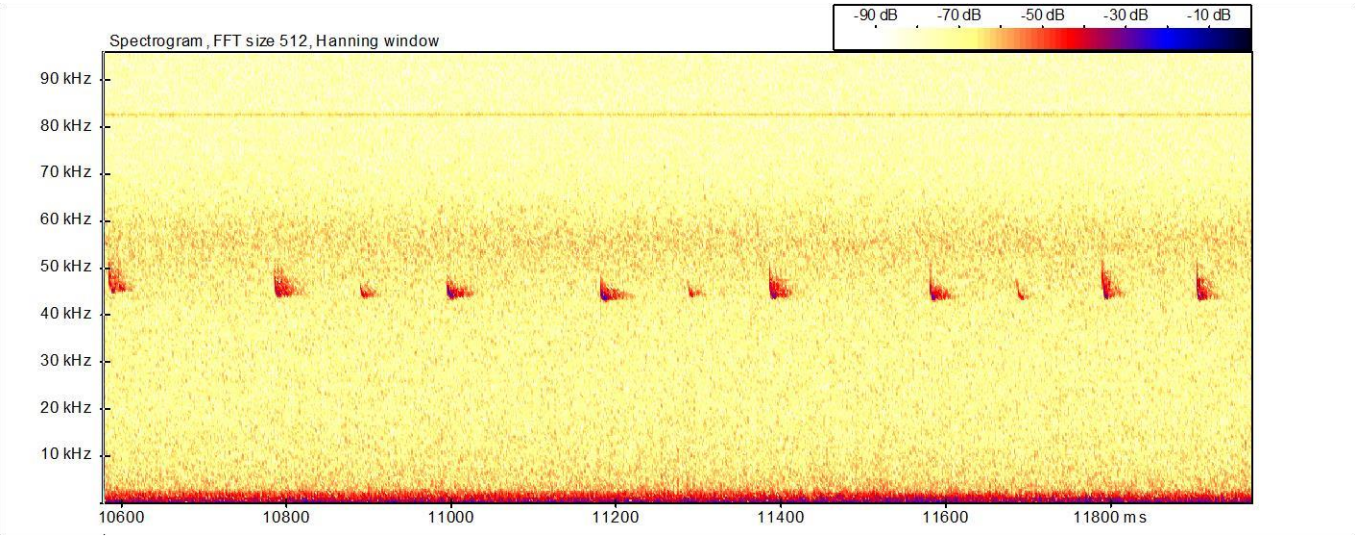


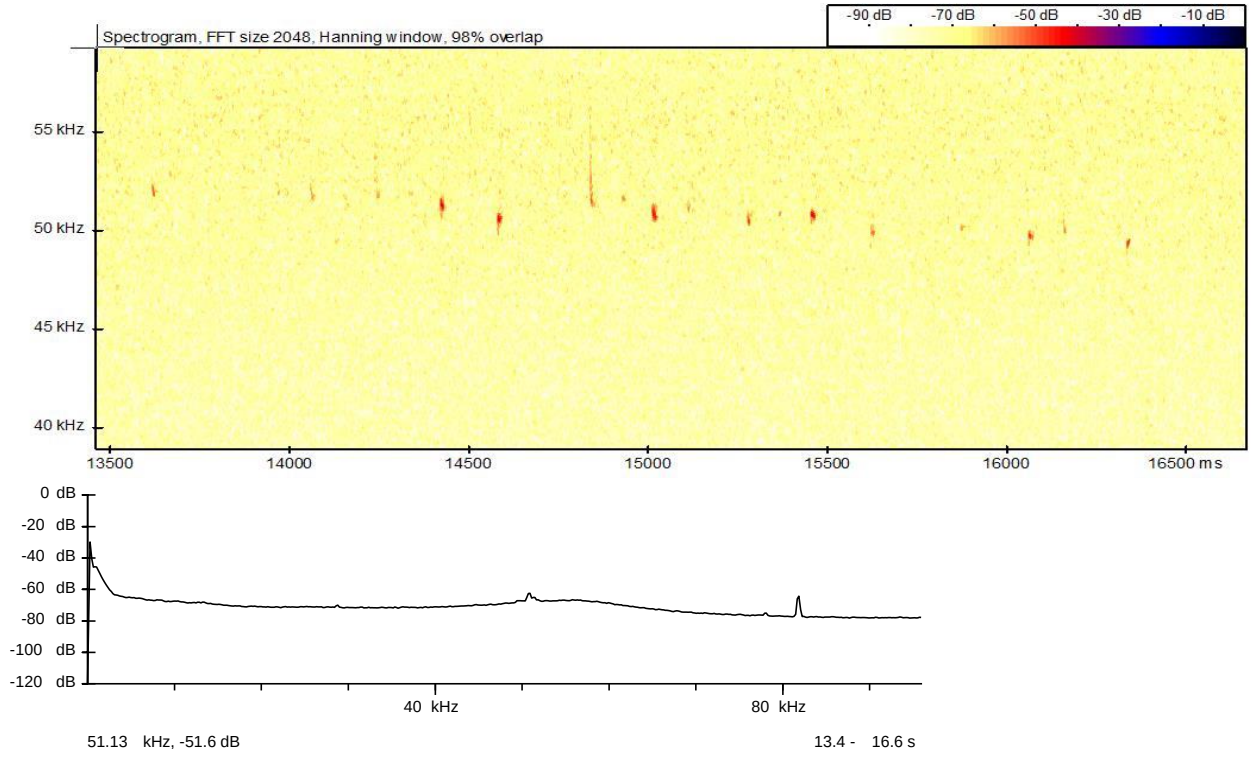
Figure 5. Bat activity around the Alps and Arklow Castle in August 2017

Blue circle = Soprano pipistrelle, Green circle = Common pipistrelle,

Black circle = Daubenton's bat, Yellow circle = Leisler's bat

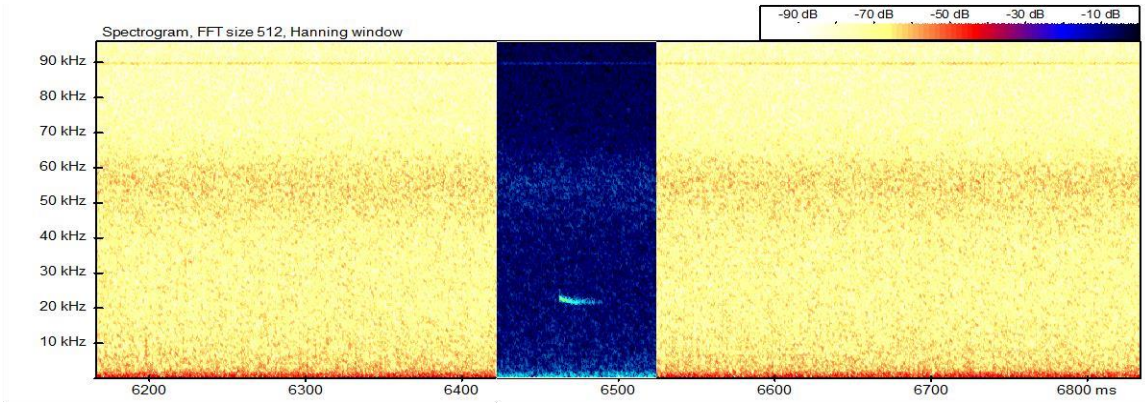


Common pipistrelle signal depicted in a spectrogram plotting the range of frequencies against time and strength

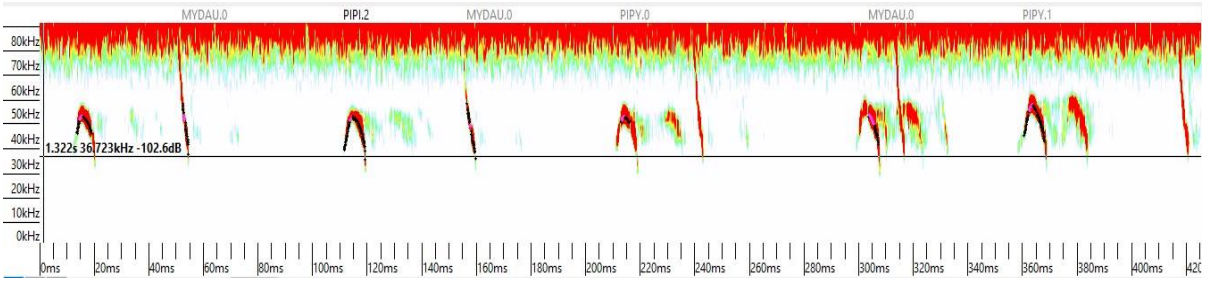


Soprano pipistrelle signal depicted in a spectrogram plotting the range of frequencies against time and strength, recorded at 18.45 on 19th October 2016.

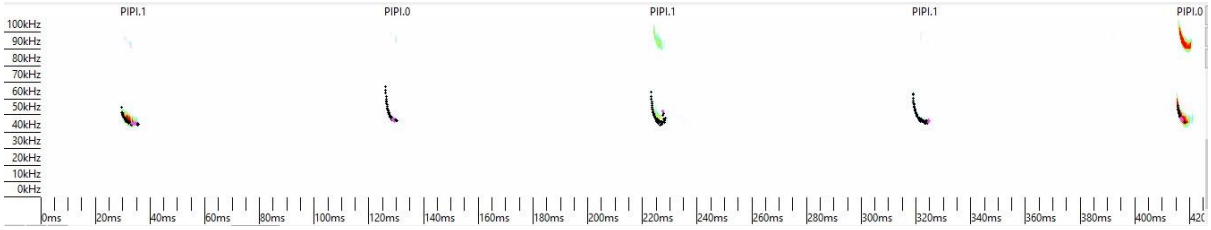
Figure 6. Common and Soprano pipistrelle signals



Leisler's bat signal



Daubenton's bat echolocation and social calls at 00.55 hours at the southern end of the river (west of the bridge)



Common pipistrelle at 23.57 hours at the southern end of the river (west of the bridge)

Figure 7. Leisler's, Daubenton's and Common pipistrelle signals

Figure 8. Crevices under which bat droppings indicate use of Arklow Bridge by roosting bats T2530673188

Figure 9. Bat boxes examined at River Walk along the Avoca River in 2017

None of these bat boxes were used by bats in 2017

Table 1. Bat Conservation Ireland records for the Arklow area

BCIreland data: search results 29 Aug 2016					
Search parameters: Roosts Transects Ad-hoc observation sites with observations of all bat species within 10km of T2530673188.					
Ad-hoc observations					
Survey	Grid reference	Grid ref easting	Grid ref northing	Date	Species
Bat Walk	T255740	325500	174000	26/08/2014	*Myotis daubentonii; Myotis mystacinus; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus*

Table 2. Bat Conservation Ireland bat roost records for the Arklow area

Name	Grid reference	Address	Species observed
Ballymoyle Sheds; Ballymoyle; Scratenagh Cross Roads	T272791	Ballymoyle Sheds Scratenagh Cross Roads; Arklow;	*Nyctalus leisleri; Pipistrellus pipistrellus*
Ballynamona Bridge; Ballynamona; Redcross;	T278828	Ballynamona Bridge; Ballynamona; Redcross;	*Myotis daubentonii; Myotis mystacinus/brandtii; Myotis spp.; Nyctalus leisleri; Pipistrellus pygmaeus; Plecotus auritus*
Residence; Kilahurler	T1809873482	Kilahurler; Arklow;	*Pipistrellus pipistrellus (45kHz)*
Derry House	T189830	Meeting of the waters; Avoca;	*Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)*
Hurley's; Clonpadden; Redcross;	T279807	Hurley's; Clonpadden; Redcross;	*Myotis spp.; Pipistrellus pygmaeus*
Inch Church; Inch; Co. Wexford.	T191668	Inch Church; Inch; Co. Wexford.	*Myotis nattereri; Myotis spp.; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus; Plecotus auritus*
Kilpatrick Bridge; Ballyrogan Lower	T266810	Kilpatrick Bridge; Ballyrogan Lower; Redcross;	*Nyctalus leisleri*
Kilpatrick Cottage	T266810	Ballyrogan; Red Cross;	*Myotis daubentonii; Nyctalus leisleri; Pipistrellus pipistrellus, Pipistrellus pygmaeus*
Lamberton Lodge	T2273	Arklow; County Wicklow	*Unidentified bat*
Residence Lynduff	T198771	Lynduff; Woodenbridge;	*Pipistrellus pygmaeus*
Residence	T204705	Plattinstown; Arklow;	*Nyctalus leisleri*
The Pines	T1965981232	Ballygahon; Avoca;	*Pipistrellus pygmaeus*
Tinnock Upper	T16976418	Tinnock Upper, Gorey; Co. Wexford	*Pipistrellus pipistrellus (45kHz)*

Table 3. Bat Conservation Ireland bat records for the Arklow area

Name	Grid reference start	Species	
Transect survey			
T05 (6) 2003-	T153661	Myotis spp.; *Nyctalus leisleri; Pipistrellus pipistrellus* (45kHz)*; Pipistrellus pygmaeus; Pipistrellus spp.* (45kHz/55kHz); Unidentified bat	

Survey	Grid reference	Date	Species
Ad-hoc observations			
Bat Walk	T255740	26/08/2014	*Myotis daubentonii; Myotis mystacinus, Nyctalus leisleri; Pipistrellus pipistrellus, Pipistrellus pygmaeus*
BATLAS 2010	T1672966957	01/09/2008	*Pipistrellus pygmaeus*
BATLAS 2010	T2251964363	06/08/2008	*Myotis daubentonii; Pipistrellus pipistrellus*
BATLAS 2010	T1757977980	12/07/2008	*Pipistrellus pipistrellus, Pipistrellus pygmaeus*
BATLAS 2010	T3029382095	07/08/2008	*Pipistrellus pipistrellus, Pipistrellus pygmaeus*
BATLAS 2010	T2651976160	09/08/2008	*Pipistrellus pygmaeus*
BATLAS 2010	T2791778487	31/08/2008	*Pipistrellus pipistrellus, Pipistrellus pygmaeus*
BATLAS 2010	T1639466730	01/09/2008	*Pipistrellus pipistrellus; Plecotus auritus*
BATLAS 2010	T2412466459	06/08/2008	*Pipistrellus pygmaeus*
BATLAS 2010	T3027281799	07/08/2008	*Pipistrellus pygmaeus; Plecotus auritus*
BATLAS 2010	T2572075090	10/08/2008	*Pipistrellus pipistrellus*
Faith Wilson	T277798	2005-07-00	*Myotis daubentonii; Myotis spp.; Nyctalus leisleri, Pipistrellus pipistrellus, Pipistrellus pygmaeus*
Faith Wilson	T275822	2005-07-00	*Myotis mystacinus/brandtii; Nyctalus leisleri; Pipistrellus pygmaeus*
Faith Wilson	T263817	2009-06-00	*Nyctalus leisleri; Pipistrellus pipistrellus, Pipistrellus pygmaeus; Plecotus auritus*
Faith Wilson	T202664	12/07/2005	*Myotis daubentonii; Pipistrellus pipistrellus, Pipistrellus pygmaeus*
Faith Wilson	T221700	12/07/2005	*Nyctalus leisleri; Pipistrellus pipistrellus*
Faith Wilson	T277801	2005-07-00	*Pipistrellus pygmaeus*
Faith Wilson	T2681	24/07/2009	*Nyctalus leisleri; Pipistrellus pipistrellus, Pipistrellus pygmaeus; Plecotus auritus*

Survey	Grid reference	Date	Species
Faith Wilson	T275829	2005-07-00	*Myotis mystacinus/brandtii; Myotis spp, Nyctalus leisleri; Pipistrellus pygmaeus; Plecotus auritus*
Faith Wilson	T216680	02/03/2006	*Pipistrellus pipistrellus, Pipistrellus pygmaeus*
Faith Wilson	T201676	13/07/2005	*Nyctalus leisleri; Pipistrellus pipistrellus, Pipistrellus pygmaeus*
NPWS Calls	T2256470324	16/10/2008	*Plecotus auritus*
NPWS Calls	T2293273830	03/04/2008	*Pipistrellus pipistrellus*

Appendix 10.3

Bat Derogation

Licence Application

An Roinn Tithíochta,
Rialtas Áitiúil agus Oidhreachta
Department of Housing,
Local Government and Heritage

Licence No.: DER/BAT 2021 – 07

EUROPEAN COMMUNITIES (BIRDS AND NATURAL HABITATS) REGULATIONS, 2011 (S.I. No 477 of 2011)

DEROGATION LICENCE

Granted under Regulation 54 of the European Communities (Birds and Natural Habitats) Regulations 2011, hereinafter referred to as "the Habitats Regulations".

The Minister for Housing, Local Government and Heritage, in exercise of the powers conferred on him by Regulation 54 of the Habitats Regulations hereby grants to **Wicklow County Council** supervised by **Brian Keeley B.Sc. (Hons)** a licence. It is stated that:

(A) This licence is to be granted for the purpose of protecting wild fauna and conserving natural habitats, and

(B) There is no satisfactory alternative, and the action authorised by this licence will not be detrimental to the maintenance of the population of **bats** referred to below at a favourable conservation status in their natural range.

The licence is issued in respect of the following **bat species**:

- **Daubenton's bat** ***Myotis daubentonii***

This licence authorises the following:

(a) Roost disturbance;

(b) Damage or destruction of breeding sites or resting places;

(c) Actions authorised within the licence

This licence is subject to the terms and conditions set out overleaf.

Terms and Conditions

1. This licence is granted solely to allow the activities specified in connection with the **Works relating to Arklow Flood Relief Scheme** located at **Arklow Bridge, Arklow, County Wicklow** for **Wicklow County Council.**

2. All activities authorised by this licence, and all equipment used in connection herewith, shall be carried out, constructed and maintained (as the case may be) so as to avoid unnecessary injury or distress to any species of **BAT**.

3. This licence may be modified or revoked, for stated reasons, at any time.

4. The mitigation measures outlined in the application report (**An Assessment of the Proposed Flood Relief Scheme at Ferrybank, Arklow, County Wicklow and Potential Impacts of The Proposal on the Bat Fauna, pgs. 16 & 17 as well as additional mitigations measures laid out on pages 2 -4**), together with any changes or clarification agreed in correspondence between NPWS and the agent or applicant, are to be carried out. Strict adherence must be paid to all the proposed measures in the application.

5. Works are scheduled to be carried out over a four year period beginning in **2021** and ending in **2025**.

6. The works will be supervised by a licensed bat specialist **agent.**

7. This licence shall be produced for inspection on a request being made on that behalf by a member of An Garda Síochána or an authorised NPWS officer appointed under Regulation 4 of the Habitats Regulations.

8. The local National Parks and Wildlife Service field officer **Damian Clarke, Damian.Clarke@chg.gov.ie**, **076 1002675** should be contacted prior to the commencement of any activity, and if bats are detected on site during the course of the work, under the terms of this licence.

9. A report shall be submitted to Wildlife Licensing Unit, National Parks and Wildlife Service Department of Housing, Local Government and Heritage, R. 2.03, 90 North King Street, Smithfield, Dublin 7, D07 N7CV on completion of the actions which this licence authorises, describing the activities carried out in pursuance of this licence.

Niall Feery
(a person authorised by the Minister to sign on his behalf)

19th January 2021

Department of Housing, Local Government and heritage
National Parks and Wildlife Service
Wildlife Licensing Unit
R. 2.03
90 North King Street, Smithfield
Dublin 7
D07 N7CV

NOTES (1 to 2).

- This licence is granted for the period specified and subject to compliance with the conditions specified. Anything done other than in accordance with the terms of this licence may constitute an offence.

- This licence applies to **bats** and to no other species.

Derogation Sought by Wicklow County Council and Office of Public Works (OPW) for works to a confirmed bat roost in Arklow Bridge supervised by ecologist Brian Keeley B.Sc. (Hons)

Permission is sought by Wicklow County Council for works to be carried out on Arklow Bridge, Arklow, County Wicklow (Irish Grid Reference T2468473497) to forward the aims and implementation of the construction of the Arklow Flood Relief Scheme at Ferrybank for Arklow town. This bridge showed evidence of serving as an occasional bat roost in 2017 and was occupied by a single Daubenton's bat on 17th November 2020 and is therefore a protected structure under the Wildlife Act and Habitats Directive.

The scientific agent for the work is Brian Keeley, Deerpark House, Maio, Tierworker, Kells, County Meath and the means to protect bats is given in the following summary. Brian Keeley Ph: 087 6753201 briantkeeley@gmail.com .

Note: This derogation licence is being applied for on behalf of Wicklow County Council and OPW for the Flood Relief Scheme. The application also includes relevant baseline information collated as part of combined survey work data for the Wastewater Treatment Plant (WWTP) and the Arklow Flood Scheme. The flood relief scheme project has some physical overlap with the approved Arklow WWTP in particular in the vicinity of Arklow Bridge. A licence relating to works to be undertaken by the WWTP and FRS was issued previously by NPWS.

Summary of Findings from survey in 2020 of Arklow Bridge

A Daubenton's bat was noted on the wing wall at the first arch from the town centre direction (southern end of the bridge) on 17th November 2020. This bat was inactive and did not move during the period of observation. However, a Daubenton's bat was noted at the bridge two hours after sunset by two separate monitors and is almost certain to have been this bat departing the site possibly to feed or re-locate roost following disturbance. The water flow was too strong to allow examination of all arches and in all 5 of the 19 arches were examined.

Summary of Findings from survey in 2017 of Arklow Bridge

Bat droppings under the upriver concrete expansion joints of the bridge are considered to be Daubenton's bats. No bats were seen to exit or emerge from the bridge on 21st August 2017. Bat activity around the bridge included Daubenton's bat feeding and commuting, soprano pipistrelle, common pipistrelle, and Leisler's bat while there was also Leisler's bat activity over the river.

The survey data and overall evaluation of the project and its impacts upon the bat roost are included in the attached report that examines the impacts of the Arklow Flood Relief Scheme.

Mitigation Proposed for works involving bridge alterations that would affect roosting bats

Derogation to destroy an existing roost site within Arklow Bridge

As all bat species recorded within the planning boundary of the proposed development are protected under Annex IV of the Habitats Directive, the works to be carried out to all arches of Arklow Bridge and their associated piers require a derogation from the National Parks and Wildlife Service of the Department of Housing, Local Government and Heritage to allow works that would create a risk to bats and would remove existing roosting options. This must be secured in advance of planning submission to ensure that the repairs are acceptable to NPWS and will not lead significant delays if the project is otherwise approved but has not secured a derogation for this purpose. The measures proposed should meet the requirements for protecting the bats availing of the Ferrybank Bridge (also referred to in this report as Arklow Bridge).

The measures proposed specifically for the arches of Arklow Bridge derogation include:

- Examination of the bridge prior to works by a bat specialist for evidence of bats.
- Exclusion of bats if necessary, with one-way valves devised by the bat specialist.
- Capture of any bats that are still present prior to works and retention until the risk of injury or re-entry to the bridge has been removed.

To ensure that there is no possibility of direct disruption to a summer roost during repairs, the following is proposed:

- The roost on the southern side of the bridge will be excluded during the autumn / early winter season (2021) before construction commences during summer 2022 under the bridge.
- 3 bat boxes will be temporarily installed on the northern side of the bridge as an interim measure to mitigate for the loss of roost (in the period summer/autumn 2021).
- Once the works on the southern side are complete, bat boxes shall be installed on the southern side. If bats are using the interim bat boxes on the northern side, these will need to be excluded before works are carried out on the northern side.
- Provision of 4 x 2FR Schwegler woodcrete bat tubes for each arch of three arches at the northern end and 3 arches at the southern end where works are undertaken (i.e. 24 x 2FR bat tubes). These bat boxes must be attached to the bridge in an unlit area above high-water mark. Refer to Drawing No 1005 of Appendix 4.1 of the EIAR which shows the location of the bat tubes on the bridge,
- Provision of additional bat boxes in the flood walls. It is proposed that 6 Schwegler 1FR bat tubes will be incorporated into the flood walls on the southern section of the project (Refer to Drawing Nos 1036, 1039, 1040 and 1041 of Appendix 4.1 of the EIAR which shows the location of the bat tubes in the walls,)., 13 x 1FR bat tubes shall be incorporated in the concrete piers of the proposed debris trap which will be located across the river channel upstream of Arklow Bridge. (Refer to Drawing Nos 1021 of Appendix 4.1 of the EIAR which shows the location of the bat tubes in the concrete piers,).
- This shall be achieved in two phases: Works to southern half of the bridge in the first year requires that only the three bat tubes are installed in the first year of works. Works to the northern half of the bridge in the third year requires that the bat boxes for the southern section of the bridge are installed for the third year of repair work. Provision of 4 x 2FR Schwegler woodcrete bat tubes for each arch of three arches at the northern end and 3 arches at the southern end where works are undertaken (i.e. 24 x 2FR bat tubes). These bat tubes must be attached to the bridge in an unlit area above high-water mark. All remaining shall be installed once all works liable to disturb or damage them has been completed.

Examination of all mature trees with roost potential prior to removal

All mature trees shall be examined for bats prior to felling. This may be achieved through a bat detector assessment if undertaken in the active season (prior to November and after March) or alternatively may require supervision at the time of felling. Any mature trees will require survey

prior to felling. This may be achieved through a bat detector assessment if undertaken in the active season (prior to November and after March) or alternatively may require supervision at the time of removal.

Lighting

- Mitigation for bats includes the following additional lighting considerations:
- No lighting shall be directed at the arches with bat boxes following completion of the work on the bridge.
- Floodlights shall be LED, as these have glass lenses which can be used to direct the light to the working area and reduce light spillage.
- Floodlights for working areas will make use of multiple lights to produce a more uniform light output and to lower the individual output from a single source – these will however still be quite high output.
- The source of light should be Light Emitting Diodes (LEDs) as this is a narrow beam highly directional highly energy efficient light source.

  The lighting should allow for a light level of 3 lux at ground level.

  Narrow spectrum lighting should be used with a low UV component.

  Glass also helps reduce the UV component emitted by lights.

Feeding sites

Provision of suitable feeding sites for bats (where possible given the nature of the scheme) would be achieved by planting lines of vegetation including trees or shrubs in particular along the river. An avenue of trees would be beneficial the most beneficial option as it would create a shelter for insects that would in turn benefit bats and birds within the area. Species such as grey willow, alder and silver birch would all be of benefit to bats, birds, and insects. However, any planting will increase the value of the site for bats.

An Assessment of the Proposed Flood Relief Scheme

At Ferrybank, Arklow, County Wicklow

And Potential Impacts of The Proposal on the Bat Fauna

Brian Keeley B.Sc. (Hons) in Zool.

November 2020[1]

Introduction

Bats constitute a total of nine of the most widespread resident protected species in Ireland. Eleven species of bat have been identified to date in Ireland, of which two were considered to be vagrant. In 2020, one of these species; the Greater Horseshoe bat was recorded in Wicklow. The second

[1] Note, since the application was submitted to NPWS for approval in Nov 2020, a number of design changes were made to the scheme, namely bat tubes were included in the design of the concrete piers of the debris trap. These changes were agreed via correspondence with the NPWS early 2021. For completeness and to avoid confusion, this document has been updated to incorporate those changes

species, Brandt's bat was also noted in the same area of Wicklow. There is a rich diversity of bats within the county and bat activity is very often higher close to rivers, lakes, and other wet areas. Bats occur in the rural and the urban environment. They feed upon insect fauna at night and during the day, they occupy buildings and occasionally trees for short or long periods. Buildings are a vital element of the annual cycle of all Irish bat species and at no time more so than the period May to August, but many bats may also avail of buildings as hibernation sites. Changes to a site may reduce the lands available to bats as a feeding site and in some cases may even destroy their dwelling place through or during the partial or total demolition, restoration and renovation of buildings, bridges, clearance activities and the subsequent construction.

Bats are protected by Irish and EU law and to prevent unlawful injury or death, it is essential that a full understanding of the site is available in advance to protect the resident bats from unintentional disturbance and to create a pathway by which a legal derogation and exemption may be designed in consultation with the National Parks and Wildlife Service of the Department of Housing, Local Government and Heritage.

This assessment examines sites within the centre of Arklow town and associated areas where the Flood Relief Scheme (FRS) proposal for the alleviation of the risk of flooding of the town which has occurred previously and is anticipated to be a higher frequency event into the future.

This assessment will address the potential for bats roosting within the site that will be altered by the scheme and within the area around it that may have some knock-on impacts including the bunds, embankments or solid barriers, the removal of vegetation to provide for suitable construction areas and the alteration to any structures to facilitate the successful incorporation of these measures.

Previous evaluations in the area including house visits, ad hoc observations and survey data recorded by Bat Conservation Ireland have determined the presence of common pipistrelles, soprano pipistrelles, Daubenton's bats, Natterer's bats, brown-longed eared bats, and Leisler's bats. Other species in surrounding areas include one of the first records of Nathusius' pipistrelles

and a roost of this species in Wexford town 58 km to the south-west. This species was first reported from this area on the Blessington Reservoir 23 years ago, 42 km to the north-west.
Additionally, the only confirmed record of Brandt's bat in Ireland was recorded in Glendalough approximately 27 km to the north-west. While these would appear considerable distances, these are two species that show high migratory habits in other European countries. Nathusius' pipistrelle have been recorded in England, having been ringed in Latvia and Lithuania. A less migratory bat species, the Greater Horseshoe bat, has been recorded twice in Ireland, once in Wexford and as noted earlier, once in Wicklow (27 km from Arklow).

Methodology

There are a number of elements of the survey that were targeted for examination in addition to a general evaluation of bat activity and presence within the footprint of the proposal and adjacent lands to the proposal for the Flood Relief Scheme (FRS). A summary of the objectives is given below.

1. the footprint of the embankment where works are proposed in Arklow Town Marsh
2. the northern side of the river at the proposed debris trap site(s).
3. Arklow Bridge.
4. near the M11 bridge upriver of Arklow town.

A survey in October 2016 examined the bat activity between the river and the buildings along Brigg's Lane and at Ferrybank (R772) including the footprint of the proposed Arklow Town Marsh embankment, the lands behind the petrol station and the green area to the rear of the Presbyterian Church.

A Songmeter BAT+ was placed within the line of the proposed embankment (the edge of a construction site opening on to dense rushes) and remained here from prior to sunset (18.20 hours) up to 21.30 hours.

Surveying in 2017 was undertaken in August, a period of the year when many maternity roosts are still intact prior to the autumn disbandment of these gatherings and the formation of lesser mating assemblages and non-breeding groups or individual roosting behaviour.

The survey examined the sites listed above (sites 1 to 4) involving a two-person survey of Arklow Bridge by means of a visual inspection on Tuesday 22nd August at 17.18 hours and a bat detector evaluation from 21st August to 22nd August (sunset at 20.38 and sunrise at 06.18). Surveying of the land-take of the proposal and the Avoca River were undertaken on 22nd to 23rd August 2017 from 20.35 to 22.00 hours and from 05.20 hours to 06.20 hours and finally on 28th August 20.22 hours for over an hour and from 05.30 hours to 06.30 hours.

Survey conditions and constraints

The survey in June 2016 was carried out on a mild dry night with no wind. There had been rain early in the day but there was no rain at any stage during the night. Some of the survey area is coastal and there is a continuous breeze wherever there are no buildings. The remainder of the buildings was sheltered from the breeze. These were ideal conditions for bat activity. Surveying for bats in late June is a very suitable time to address the summer usage of a site for feeding and commuting and for assessing the use of trees as summer roosts.

The second survey period was a period of mild weather in October and there was a dry, calm spell that commenced with moderate temperatures and dropping two to three hours after sunset. Bat activity was relatively high especially on 17th October and this is a good representation of the bat fauna in autumn in the survey area. Sunset on 17th October was at 18.24 hours and a temperature of 13 degrees Celsius with a moderate breeze and dry conditions. 19th October 2016 was at 18.20 hours and the temperature at that time was 11 degrees Celsius and cloudy.

The survey in August 2017 was during mild dry weather and bat activity was noted at all periods of the survey. Pre-dawn conditions were cool and dry and bat activity was typically lower during this period. This was a representative survey of the site.

A third year of survey was undertaken on November 17th, 2020 to determine the status of Arklow Bridge in relation to bat occupancy. This follows a gap of 3 years between surveys. The survey involved a visual examination of the bridge in daylight at low tide followed by a bat detector evaluation for evidence of emergence and bat activity. This involved the placement of a

Songmeter Mini downriver to the east of the bridge as close as possible to the most southern arch and holding an Echometer 3 upriver of the bridge at the same arch.

Survey conditions and constraints 2020

The survey in 2020 was undertaken in mid-November and is at a time of year when bat activity is very low and is typically entirely absent in the Midlands and East coast of Ireland. The weather conditions were mild at the commencement of the study, but wind speed picked up towards 16.00 hours and was very windy towards the centre of the river. The river was low due to the tide being out but having had a number of heavy rains previously, the current was very strong in the river and safety concerns restricted the assessment to the two southernmost arches and the three northernmost arches. All arches with the exception of the northernmost arch had a dangerous current that was too strong to cross or stand still.

Existing Environment

Bat roosts affected by the Arklow Flood Relief Scheme proposal

Roost site of Daubenton's bat (*Myotis daubentonii*) within Arklow Bridge arches.

One Daubenton's bat was noted resting on the wing wall of the older bridge section at the most southern arch of the bridge (closest to the town centre) close to the bridge expansion (western side of bridge) on November 17th, 2020. This bat was not seen to become active as it was not visible from the riverbank but signals on both detectors indicate that a Daubenton's bat flew past at approximately 10.20 hours. There was evidence gathered in August 2017 that bats were availing of crevices in the upriver side of the bridge (west) to roost at the southern end of the bridge. This was in the form of clusters and individual droppings below the crevices. The northern end offers very suitable roosting conditions, but no bat signs or bats were present within this section either in 2017 or 2020.

Bats are using Arklow bridge as a roost site (western side of the southern end of the bridge). This is likely to be most often individuals roosting rather than a maternity roost and it is a transitional roost. On 17th November 2020, a single Daubenton's bat was noted roosting on the bridge.

Bat fauna feeding and commuting within and through the FRS site

Common pipistrelle *Pipistrellus pipistrellus*
Soprano pipistrelle *Pipistrellus pygmaeus*
Leisler's bat *Nyctalus leisleri*
Daubenton's bat *Myotis daubentonii*

Common pipistrelles were noted at all times throughout the survey period and throughout Arklow town. This is the most widespread species in Europe and is most often the most commonly encountered bat species. Common pipistrelles were widespread in Arklow in summer in 2016 and 2017. In October 2016, males of this species were noted calling along the riverbank south of the river. Common pipistrelles were also noted along the lands that would flank the proposed embankment, north of the river. This species was heard within the fields adjacent to Brigg's Lane behind Ferrybank around a derelict house and along the disused railway line.

Soprano pipistrelles were more numerous along the river and in marshy areas close to the river. This was the first bat to be noted around the mature trees along the river and one individual was present along the disused railway line for several minutes as well as feeding and calling around the derelict house.

Soprano pipistrelles were seen and heard along the southern riverbank west of Arklow Bridge and were the only species noted prior to dawn on 18th October 2016. Similarly, in August 2017, soprano pipistrelles were the most commonly encountered bat species prior to dawn.

The SM2 north of the river on 19th October 2016 revealed the presence of three species of bat; Leisler's bat, common and soprano pipistrelle. Each bat only occurred on one occasion between 18.15 hours and 21.30 hours.

Daubenton's bats were heard over several hours along the river and were also noted flying from the rear of the houses north of the river towards the river. Daubenton's bats were not roosting in any of the trees that will be removed by the proposed FRS embankment. Daubenton's bat activity was noted along the river from the Ferrybank Bridge to Arklow Castle and onwards to the M11 motorway bridge.

Ireland is considered to be a stronghold for Leisler's bats and this species is encountered throughout Leinster and the east coast. This bat fed throughout Arklow while moving to and from a roost site that was not within the FRS land take itself in June 2016.
The final bat observed prior to dawn was last noted flying towards the Avoca River in a south-westerly direction and it is probable that this individual was crossing towards the town over the river.

Leisler's bats were very briefly present on October 19th, 2016 at 19.31 hours and otherwise there was very little activity. This species was present in August 2017 but was less in evidence than all other species. A Leisler's bat was seen and heard flying over the Main Road, Arklow close to the Castle ruins area prior to dawn away from any areas within the FRS scheme.

Common pipistrelle activity was the first noted at the ruins of Arklow Castle (19.08 hours) in the survey undertaken in October and this was followed 12 minutes later by soprano pipistrelle activity. Neither species was seen to return to Arklow Castle prior to dawn. However, on cold mornings, it is possible that bats have returned during the night and have not re-emerged to feed.

In August, no bats emerged or returned to the Castle. A number of bats were noted returning towards the town from the area west of Arklow Bridge prior to dawn but not to the Castle. Pipistrelle activity was noted heading to the southwest of the river. A Leisler's bat was noted flying to the south as discussed earlier in these results in the vicinity of the Castle (but clearly flying beyond the Castle). The roost that was present within the Castle would appear to be absent in August and October and given that the emergence area is more overgrown than when bats were present previously, it is probable that bats are either scarce or absent from the building.

Daubenton's bats were present close to water in almost all encounters with some Daubenton's bat activity in Arklow Marsh behind the houses at Ferrybank being the only exception.

Bat activity was predominantly soprano pipistrelle along the river with Daubenton's bat activity in various sections including at the northern end (west of the bridge) and up as far as the survey followed to the M11 bridge.
Common pipistrelle activity was present both west and east of the southern end of the bridge as well as along the river walk, west of Arklow Bridge towards Arklow Castle and up as far as the M11. Common pipistrelles were second to soprano pipistrelles in frequency of encounter.

Leisler's bats were noted on occasion throughout the site but were much less common than all other species.

Trees at the northern end of the town bridge offered low roost potential. Some of these had been removed by November 2020. Trees within the hedgerows north of this point have higher roost potential.

No roosts were noted in any of the trees examined prior to dawn and it was considered most probable from pre-dawn activity that bats were heading towards the houses at Ferrybank or further afield.

There is historic evidence of use of the Castle including information provided by the resident of the house adjacent to the Castle from childhood and up to recent years.

None of the bat boxes along the riverbank had been occupied by bats. These bat boxes were in clutter and ivy was blocking a number of the box entrances. A bat box at the Arklow Ponds was examined from ground level with a torch (not checked from a ladder) and no droppings or bat was visible. Bat activity over the Arklow Ponds during an evaluation in 2017 was high and included Daubenton's bats, Leisler's bat, soprano and common pipistrelle. Several bat boxes around the Ponds are known to be in use (Enda Mullen, NPWS pers. Comm.). Ms Mullen provided the following additional information: there is a pipistrelle roost in a building near Arklow Bay Hotel (west of Arklow Pond), and another bat roost in the OPW building in Arklow town.

Modifications or Features introduced by the Flood Relief Scheme

Lighting - Vegetation Clearance - Vegetation screening - Bridge repairs

There will be an increased level of lighting through illumination during the 4 year construction period required for night-time work at the river. There may be an increased level of lighting brought about through tree removal and exposure of the area to the town lighting. Lighting upon the bridge at present is most probably intrusive for roosting bats but is primarily focussed to the east of the bridge while roost sites are to the western side of the bridge. This may create disturbance of light intolerant or shy species at present while the more urban-adapted species will be affected only over a short-term period. Of the species noted on and around the site, no bats would be considered light intolerant as they will generally avoid direct illumination but are not usually fully excluded by the presence of light.

Lighting for the night work may be more disruptive as it will need to create suitable illumination for work as well as access.

Pipistrelles, the main species within the area, are negatively affected by lighting but to a lesser extent than most Irish species. Leisler's bats are the most tolerant of light of the three species noted. This species will feed around lighting in car parks as the night progresses. There are no roosts directly illuminated by changes to the site as there were no roosts noted within the site in June 2016 or in August 2017.

There will be tree felling and some scrub removal within the river. The mature conifers along the river have already been removed but there may be some further tree removal here, of which there is low to no roost potential considered for the remaining trees.

The provision of any screening with vegetation provides feeding and commuting potential for bats. There will be alterations (removal) to the vegetation including mature trees within the river. Dredging will affect insect availability and would affect feeding success within this area for bat species such as Daubenton's bat and soprano pipistrelle in particular.

Repairs to Arklow Bridge will remove crevice roost sites for bats such as the Daubenton's bat. Vegetation on the bridge is required to be removed for engineering integrity reasons

1) There is the potential for leakages of grout getting into the river (this is addressed in further reports on the proposed scheme.
2) There will be permanent loss of riverbed habitat where the scour protection is constructed.
3) Underpinning of the bridge piers and abutments;
4) Lowering of the floor of the Arklow Bridge by approximately metre;
5) Provision of scour protection to the bridge piers; and
6) Repairs to the masonry work of the older section of the bridge.

The approach for carrying out the works on the bridge will be as follows. All bridge works (phases 1-4) will be fully completed for approx. a third of the bridge each year. Note that the working area will extend beyond a third to allow for bunds, working space, etc**. In-stream works are restricted to the summer season due to fisheries constraints,** therefore it is not possible to carry out the in-stream underpinning works between 1st September and-31st March.

Year 1 (2022) - Works to southern half of the bridge (phases 1-4). There will be considerable disturbance in the southern half during that summer but there will be little/no disturbance to northern half of the bridge for first year.

Year 2 – Works to central part of the bridge (phases 1-4). There will be little/no disturbance to southern quarter of bridge and little disturbance to northern quarter of bridge (passing construction traffic) for second year;

Year 3 - Works to northern half of the bridge (phases 1-4).. There will be considerable disturbance in the northern half during that summer but there will be little/no disturbance to southern half of the bridge for third year.

Potential Impacts of The Proposed Arklow FRS

Loss of Actual and Potential Roosts and Risk of Injury to Bats

As discussed above, the Arklow Bridge bat roost will be subjected to considerable disturbance and disruption and may be temporarily lost during the work carried out here or permanently lost through any work carried out on the bridge structure.

There will be the removal of the bat boxes along the river. These offer roosting opportunities specifically geared towards bats.

In all, this creates a long-term moderately negative impact upon bats.

Disturbance from lighting

Lighting will be increased by the presence of lighting for night-time work and as regards long-term changes by vegetation clearance and no additional lighting is foreseen for the Flood Relief Scheme. Species such as common pipistrelle and Leisler's bat are less affected than all other Irish bat species (but are less common in lit sites than in dark sites of similar habitat) and this would not be a significant impact overall in the current situation. Lighting along the river is higher in 2020 than in it was in 2016 or 2017.

At worst, it would be a permanent slightly negative impact as well as a short-term moderately negative impact.

Reduced Feeding

There will be reduced feeding at Arklow Bridge from the removal of trees and small islets within the river. Dredging will affect insect availability

Feeding loss around the existing trees may constitute a long-term slightly negative impact. Dredging may create a short-term moderate negative impact.

Cumulative Loss of Feeding and Commuting

The changes within Arklow, if following current trends would see a loss in green space, increase in lighting and increase in modern buildings with an associated removal of old buildings for some developments. These would all create a permanent moderate negative impact if not appropriately mitigated in each project.

Proposed Mitigation

Derogation to destroy an existing roost site within Arklow Bridge

As all bat species recorded within the planning boundary of the proposed development are protected under Annex IV of the Habitats Directive, the works to be carried out to all arches of Arklow Bridge and their associated piers require a derogation from the National Parks and Wildlife Service of the Department of Housing, Local Government and Heritage to allow works that would create a risk to bats and would remove existing roosting options. This must be secured in advance of planning submission to ensure that the repairs are acceptable to NPWS and will not lead significant delays if the project is otherwise approved but has not secured a derogation for this purpose. The measures proposed should meet the requirements for protecting the bats availing of the Ferrybank Bridge (also referred to in this report as Arklow Bridge).

The measures proposed specifically for the arches of Arklow Bridge derogation include:

- Examination of the bridge prior to works by a bat specialist for evidence of bats.
- Exclusion of bats if necessary, with one-way valves devised by the bat specialist.
- Capture of any bats that are still present prior to works and retention until the risk of injury or re-entry to the bridge has been removed.

To ensure that there is no possibility of direct disruption to a summer roost during repairs, the following is proposed:

- The roost on the southern side of the bridge will be excluded during the autumn / early winter season (2021) before construction commences during summer 2022 under the bridge.

- 3 bat boxes will be temporarily installed on the northern side of the bridge as an interim measure to mitigate for the loss of roost (in the period summer/autumn 2021).

- Once the works on the southern side are complete, bat boxes shall be installed on the southern side. If bats are using the interim bat boxes on the northern side, these will need to be excluded before works are carried out on the northern side.
- Provision of 4 x 2FR Schwegler woodcrete bat tubes for each arch of three arches at the northern end and 3 arches at the southern end where works are undertaken (i.e. 24 x 2FR bat tubes). These bat boxes must be attached to the bridge in an unlit area above high-water mark. Refer to Drawing No 1005 of Appendix 4.1 of the EIAR which shows the location of the bat tubes on the bridge.

- Provision of additional bat boxes in the flood walls. It is proposed that 6 Schwegler 1FR bat tubes will be incorporated into the flood walls on the southern section of the project (Refer to Drawing Nos 1036, 1039, 1040 and 1041 of Appendix 4.1 of the EIAR which shows the location of the bat tubes in the walls) and 13 x 1FR bat tubes shall be incorporated in the concrete piers of the proposed debris trap which will be located across the river channel upstream of Arklow Bridge. ((Refer to Drawing Nos 1021 of Appendix 4.1 of the EIAR which shows the location of the bat tubes in the concrete piers,)..
- This shall be achieved in two phases: Works to southern half of the bridge in the first year requires that only the three bat tubes are installed in the first year of works. Works to the northern half of the bridge in the third year requires that the bat boxes for the southern section of the bridge are installed for the third year of repair work. Provision of 4 x 2FR Schwegler woodcrete bat tubes for each arch of three arches at the northern end and 3 arches at the southern end where works are undertaken (i.e. 24 x 2FR bat tubes). These bat tubes must be attached to the bridge in an unlit area above high-water mark. All remaining shall be installed once all works liable to disturb or damage them has been completed.

Examination of all mature trees with roost potential prior to removal

All mature trees shall be examined for bats prior to felling. This may be achieved through a bat detector assessment if undertaken in the active season (prior to November and after March) or alternatively may require supervision at the time of felling. Any mature trees will require survey

prior to felling. This may be achieved through a bat detector assessment if undertaken in the active season (prior to November and after March) or alternatively may require supervision at the time of removal.

Lighting

- Mitigation for bats includes the following additional lighting considerations:
- No lighting shall be directed at the arches with bat tubes following completion of the work on the bridge.
- Floodlights shall be LED, as these have glass lenses which can be used to direct the light to the working area and reduce light spillage.
- Floodlights for working areas will make use of multiple lights to produce a more uniform light output and to lower the individual output from a single source – these will however still be quite high output.
- The source of light should be Light Emitting Diodes (LEDs) as this is a narrow beam highly directional highly energy efficient light source.

  The lighting should allow for a light level of 3 lux at ground level.

  Narrow spectrum lighting should be used with a low UV component.

  Glass also helps reduce the UV component emitted by lights.

Feeding sites

Provision of suitable feeding sites for bats (where possible given the nature of the scheme) would be achieved by planting lines of vegetation including trees or shrubs in particular along the river. An avenue of trees would be the most beneficial option as it would create a shelter for insects that would in turn benefit bats and birds within the area. Species such as grey willow, alder and silver birch would all be of benefit to bats, birds, and insects. However, any planting will increase the value of the site for bats.

APPENDICES

Bat activity along the River on October 17th, 2016

Green circles = common pipistrelles Blue paddle = soprano pipistrelle
Purple paddle = pipistrelles and Daubenton's
"D" = Daubenton's P = 2 pipistrelle species * indicates pre-dawn bat signals

Bat activity around the proposed FRS site October 19th, 2016

The majority of signals are shown as blue circles and represent soprano pipistrelles
Green paddle = Common pipistrelle "D" = Daubenton's P = 2 pipistrelle species at the same time

Bat activity along the River on October 17th, 2016

Each flag denotes a recording for an individual bat at the time indicated by the last four-digit number

Close-up along the Avoca River to the west of Arklow Bridge

Bat activity in August 2017 at Ferrybank

Legend

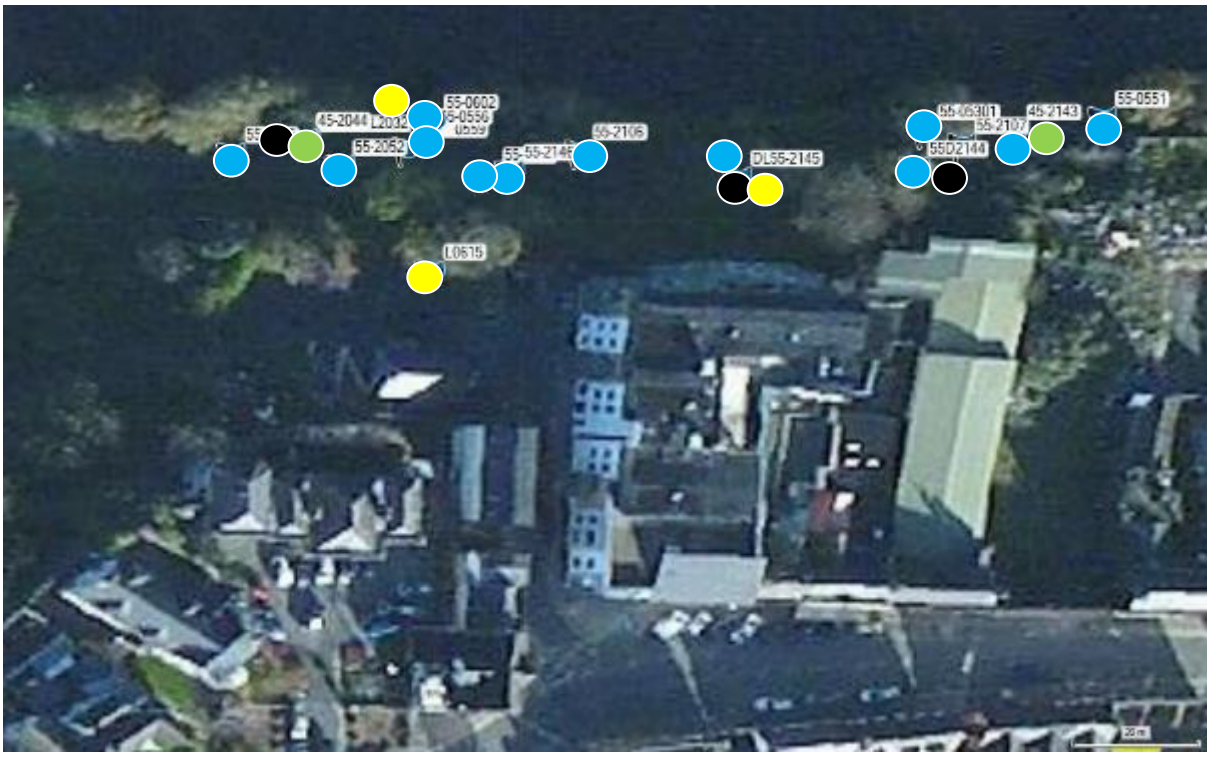
Blue circle = Soprano pipistrelle *Green circle=Common pipistrelle*

Bat activity close to the M11 bridge in August 2017

Legend

Blue circle = Soprano pipistrelle *Green circle=Common pipistrelle*

Black circle = Daubenton's bat

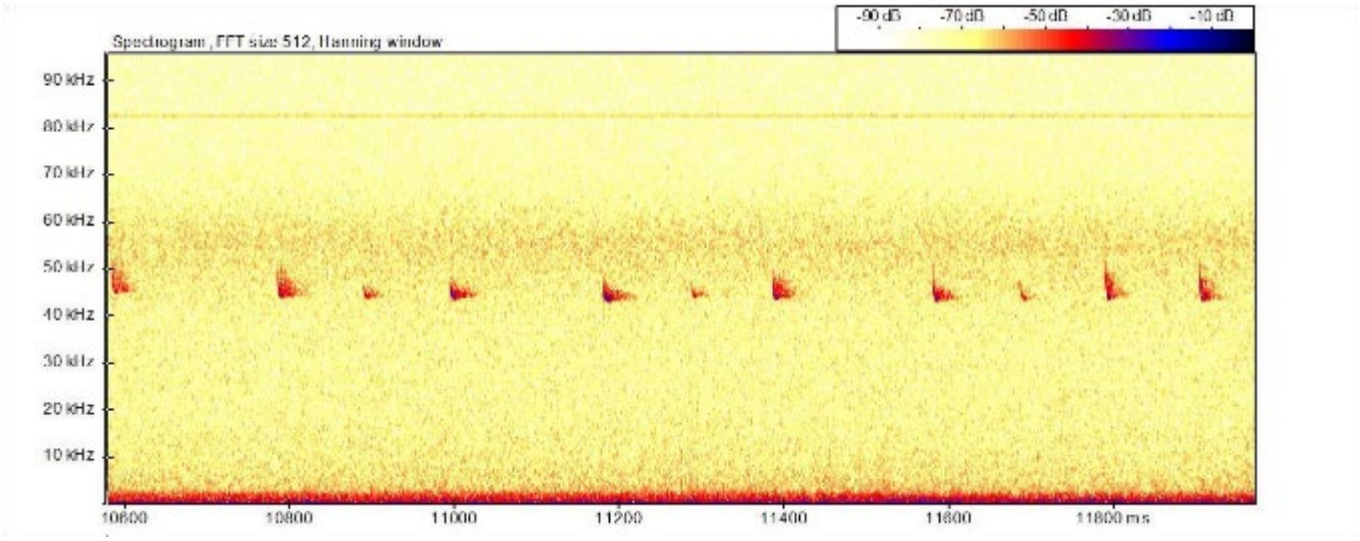


Bat activity near Arklow Castle west of Arklow Bridge in August 2017

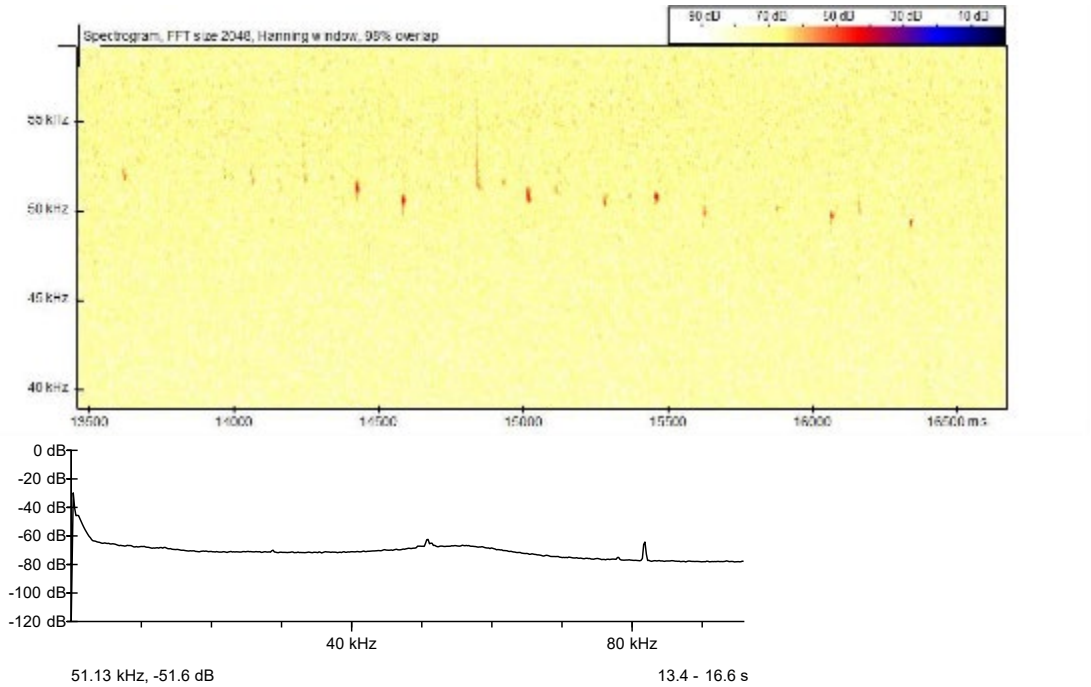
Legend

Blue circle = Soprano pipistrelle *Green circle = Common pipistrelle* Black circle = Daubenton's bat

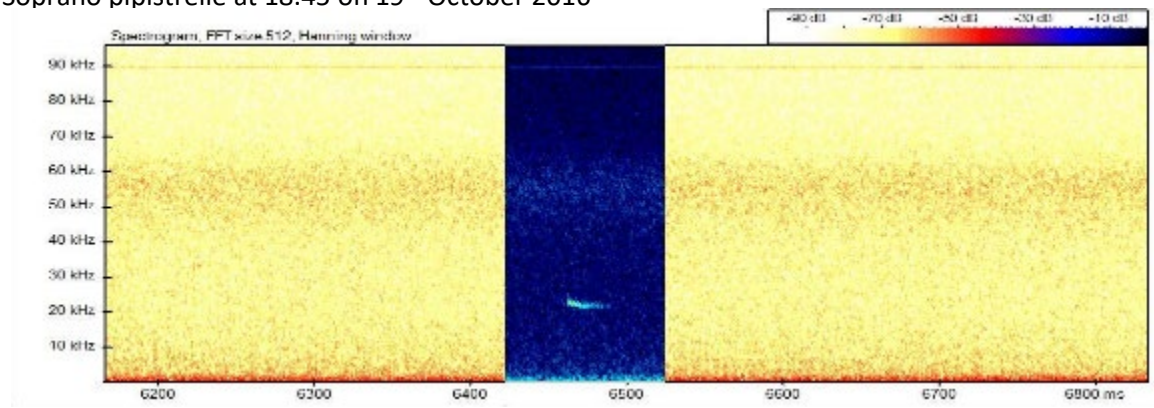
Yellow circle = Leisler's bat



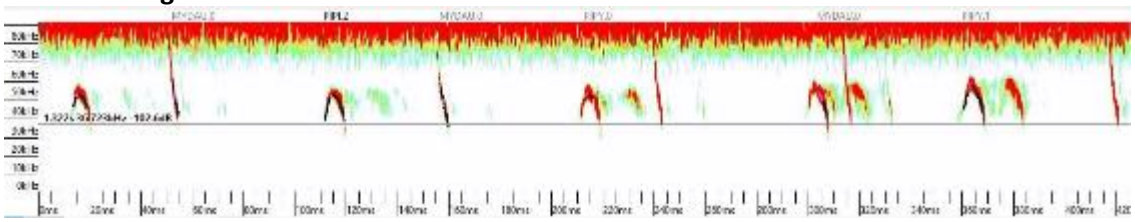
Common pipistrelle signal depicted in a spectrogram plotting the range of frequencies against time and strength



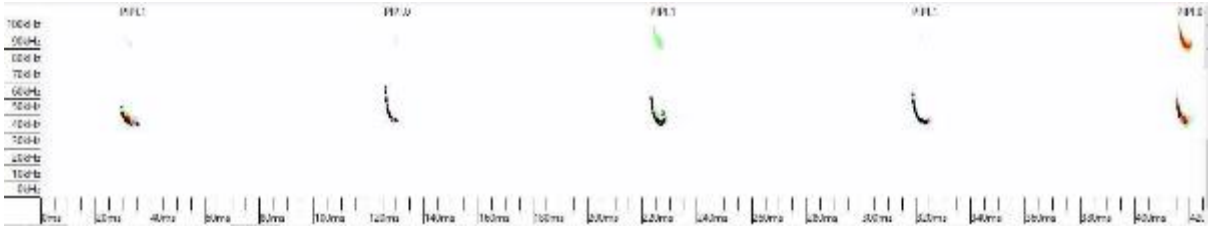
Soprano pipistrelle at 18.45 on 19th October 2016



Leisler's bat signal



Daubenton's bat echolocation and social calls at 00.55 hours at the southern end of the bridge (west side)



Common pipistrelle at 23.57 hours at the southern end of the river (west side)

Bridge crevices under which bat droppings indicate use of the bridge by roosting bats T2530673188

Daubenton's bat on the southernmost arch of Arklow Bridge November 17th, 2020

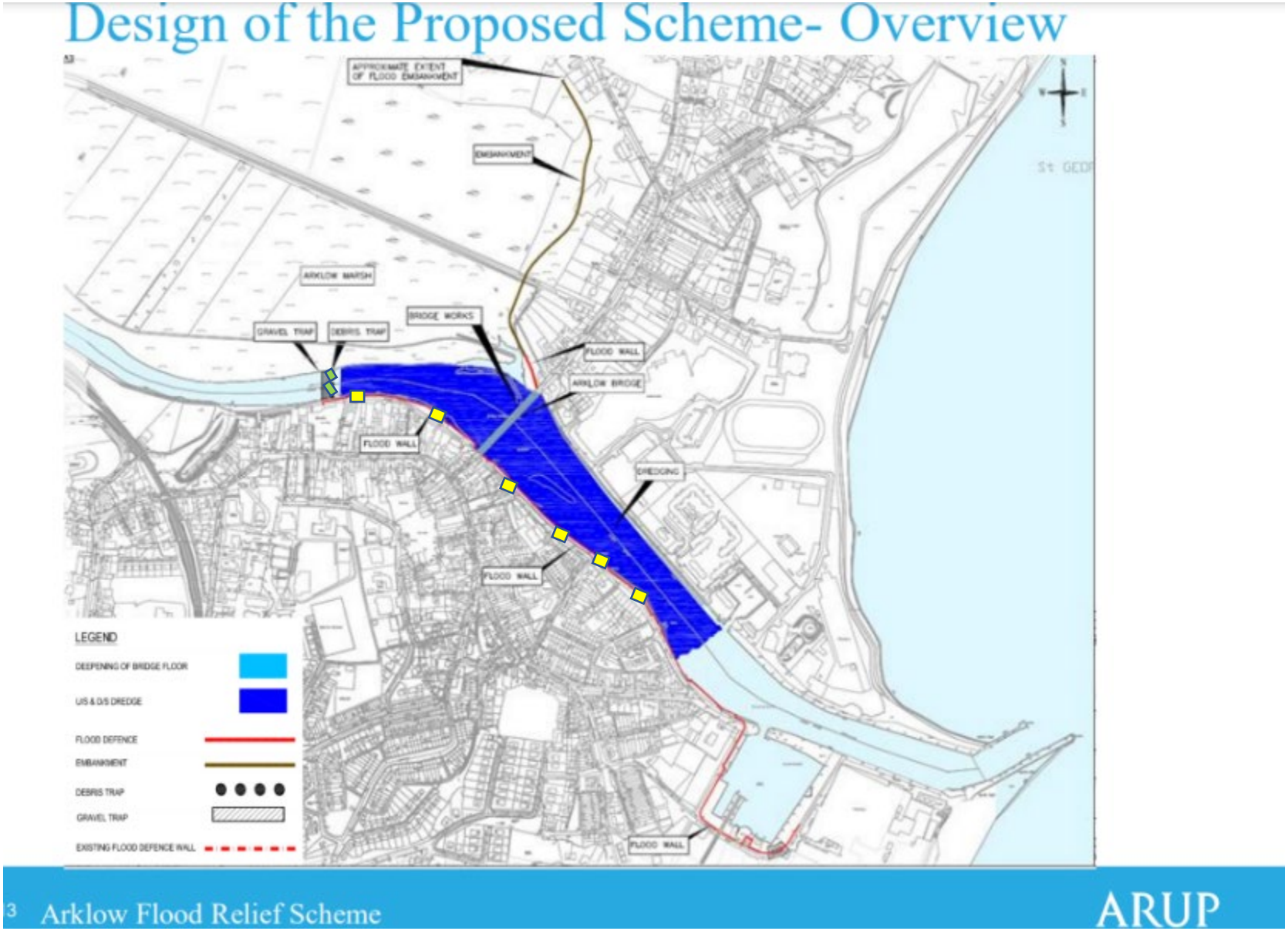
Existing lighting of the bridge. Most illumination is to the east while bats roost to the west. Nonetheless, lighting has increased considerably since 2017

Trees and islets that will be removed by the scheme

Bat boxes examined along the Avoca River in 2017

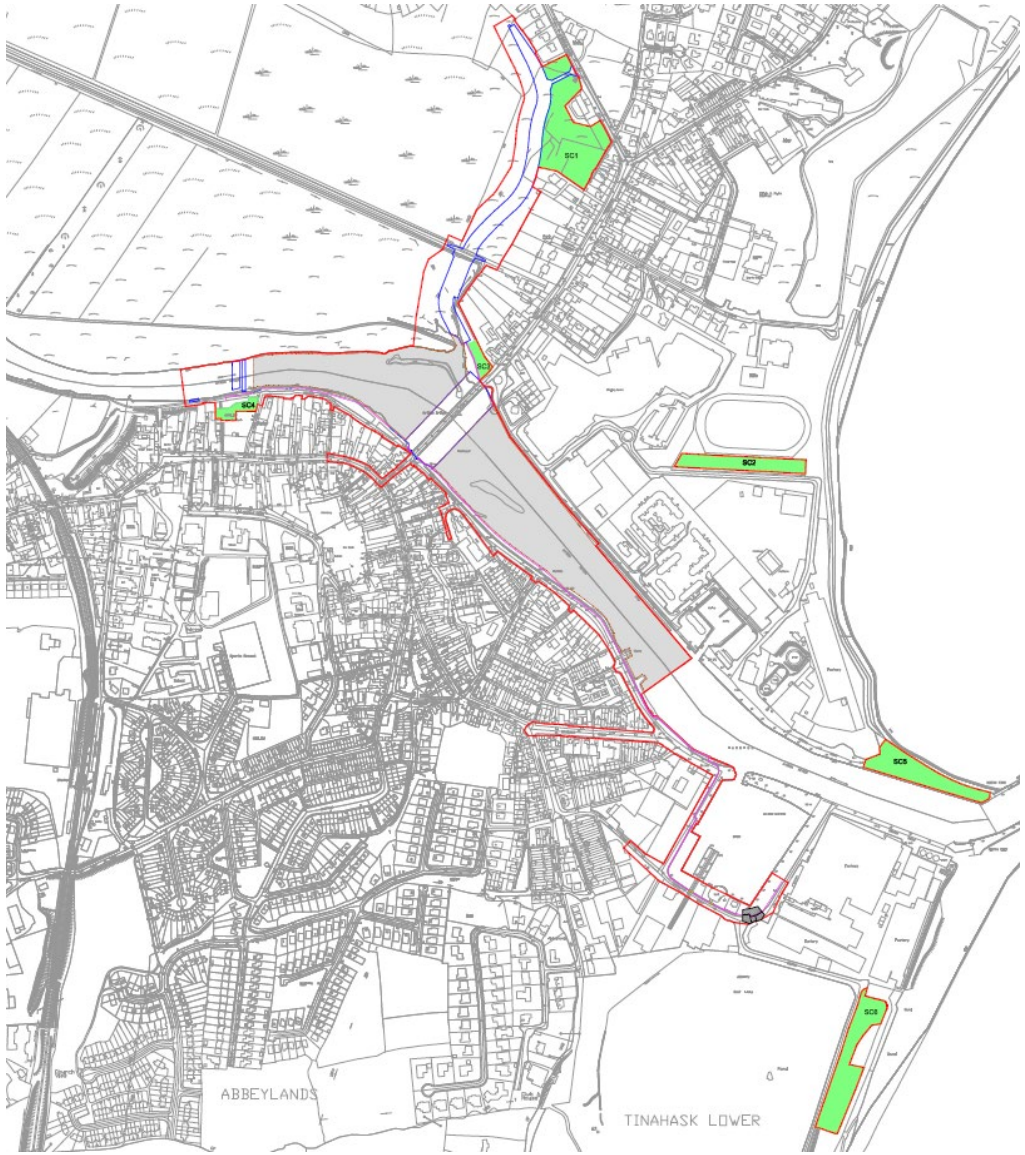
None of these bat boxes were used by bats. The tree on the right was photographed in 2020 with a greater level of lighting evident.

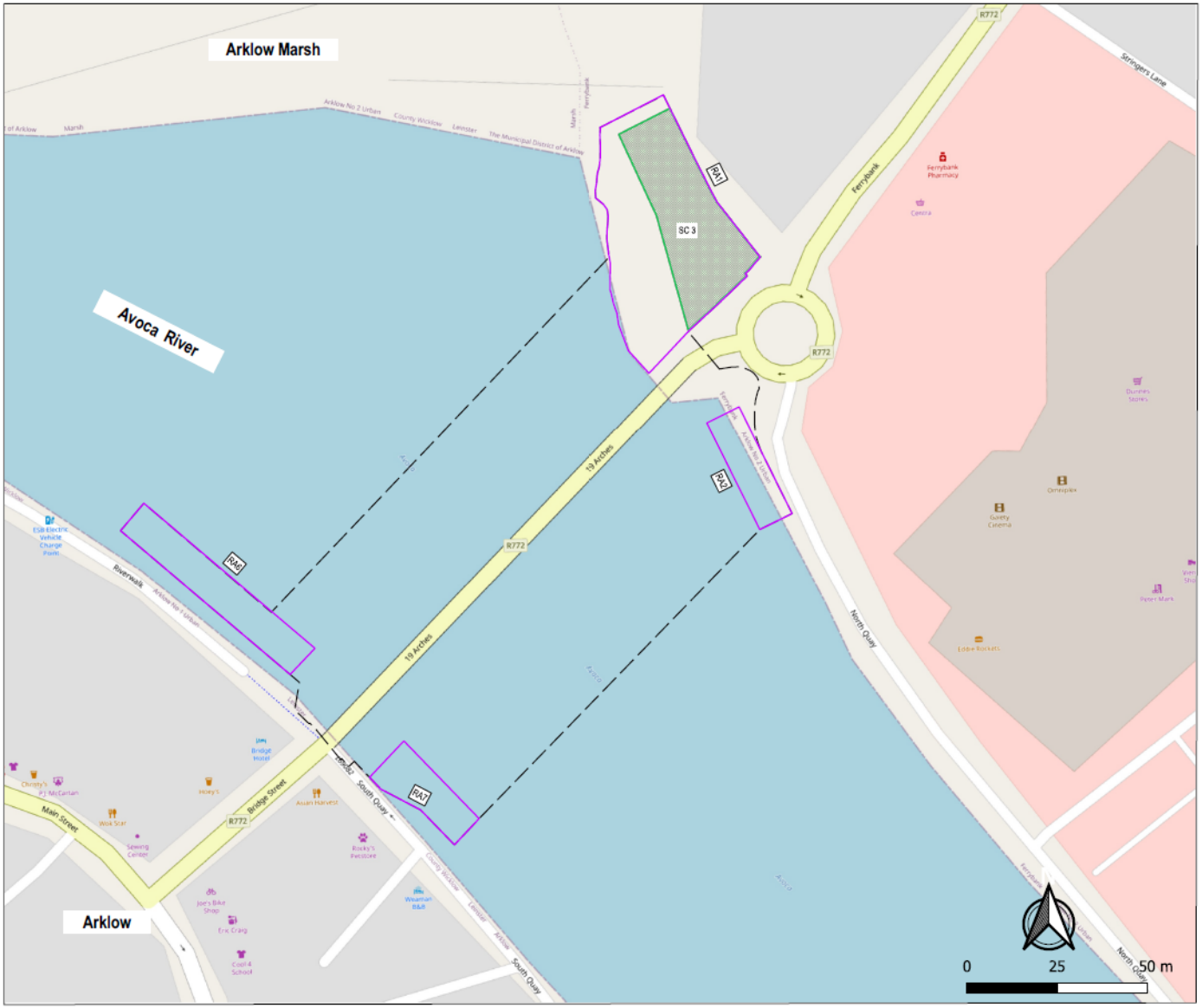
Habitat towards the M11 Bridge.



The yellow boxes indicate the proposed locations for additional Schwegler 1FR bat tubes in the walls. The green boxes indicate the proposed locations of the 13 x 1FR Schwegler bat tubes

Construction of the Proposed Scheme – Overview





LEGEND

- WP 1 - Working Area
- River Access (RA)
- Site Compounds (SC)

WICKLOW ENDLESS OPPORTUNITIES

OPW BYRNELOOBY

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CLIENT:
WICKLOW COUNTY COUNCIL

PROJECT:
ARKLOW FLOOD RELIEF SCHEME

ENIVRONMENTAL IMPACT ASSESSMENT REPORT
FIGURE 5.8 WORKING AREA (WA1) AND SITE ACCESS LOCATIONS

DRAWN BY: LIAM TOBIN
CHECKED BY: KAGISO SELALEDI
APPROVED BY: KIERAN THORNTON

FILE NAME: PH0886/01-WP1/WA/SA

SCALE: 1:1 000

STATUS: FOR PLANNING

Table 1: BCIreland data: search results 23rd November 2020

Search parameters: Roosts Transects Ad-hoc observation sites with observations of all bat species within 1000m of T2468473497					
Ad-hoc observations					
Survey	Grid	Grid ref	Grid ref	Date	Species
Bat Walk	T255740	325500	174000	26/08/2014	Myotis daubentonii; Myotis mystacinus; Nyctalus leisleri; Pipistrellus pipistrellus (45kHz); Pipistrellus pygmaeus

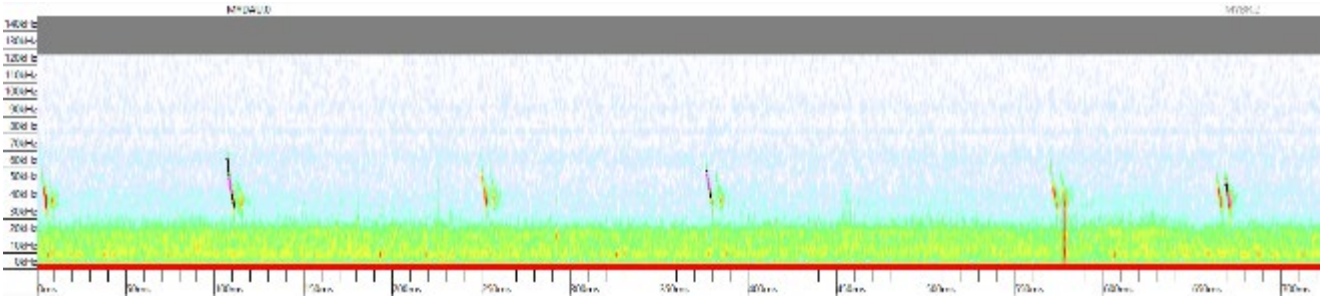
Table 2: BCIreland data for 10000 m from Arklow Bridge area: search results 23rd November 2020

Roosts			
Name	Grid reference	Address	Species observed
Ballymoyle Sheds;	T272791	Ballymoyle Sheds	Nyctalus
Ballynamona Bridge;	T278828	Ballynamona Bridge;	Myotis daubentonii; Myotis mystacinus/brandtii;
Residence; Kilahurler	T1809873482	Kilahurler; Arklow;	Pipistrellus pipistrellus (45kHz)
House	T189830	Meeting of the waters;	Nyctalus leisleri; Pipistrellus pipistrellus (45kHz)
Clonpadden; Redcross;		Clonpadden;	Myotis spp.; Pipistrellus pygmaeus
Inch Church; Inch; Co.		Inch Church; Inch; Co.	Myotis nattereri; Myotis spp.; Nyctalus leisleri;
Kilpatrick Bridge;	T266810	Kilpatrick Bridge;	Nyctalus leisleri
Kilpatrick	T266810	Ballyrogan; Red Cross;	Myotis daubentonii; Nyctalus leisleri;
Lodge	T2273	Arklow; County	Unidentified bat
Residence Lynduff		Lynduff;	Pipistrellus pygmaeus
Residence		Plattinstown; Arklow;	Nyctalus leisleri
Residence		Ballygahon; Avoca;	Pipistrellus pygmaeus
Tinnock Upper	T16976418	Tinnock Upper, Gorey;	Pipistrellus pipistrellus (45kHz)
Transects			
Name	Grid reference	Species	
T05 (6) 2003-	T153661	Myotis spp.; Nyctalus leisleri; Pipistrellus pipistrellus	
Ad-hoc observations			
Survey	Grid reference	Date	Species
Bat Walk	T255740	26/08/2014	Myotis daubentonii; Myotis mystacinus, Nyctalus leisleri; Pipistrellus pipistrellus, Pipistrellus pygmaeus
BATLAS 2010	T1672966957	01/09/2008	Pipistrellus pygmaeus
BATLAS 2010	T2251964363	06/08/2008	Myotis daubentonii; Pipistrellus pipistrellus
BATLAS 2010	T1757977980	12/07/2008	Pipistrellus pipistrellus, Pipistrellus pygmaeus
BATLAS 2010	T3029382095	07/08/2008	Pipistrellus pipistrellus, Pipistrellus pygmaeus
BATLAS 2010	T2651976160	09/08/2008	Pipistrellus pygmaeus
BATLAS 2010	T2791778487	31/08/2008	Pipistrellus pipistrellus, Pipistrellus pygmaeus

BATLAS 2010	T1639466730	01/09/2008	Pipistrellus pipistrellus; Plecotus auritus
BATLAS 2010	T2412466459	06/08/2008	Pipistrellus pygmaeus
BATLAS 2010	T3027281799	07/08/2008	Pipistrellus pygmaeus; Plecotus auritus
BATLAS 2010	T2572075090	10/08/2008	Pipistrellus pipistrellus
Faith Wilson	T277798	2005-07-00	Myotis daubentonii; Myotis spp.; Nyctalus leisleri, Pipistrellus pipistrellus, Pipistrellus pygmaeus
Faith Wilson	T275822	2005-07-00	Myotis mystacinus/brandtii; Nyctalus leisleri; Pipistrellus
Faith Wilson	T263817	2009-06-00	Nyctalus leisleri; Pipistrellus pipistrellus, Pipistrellus pygmaeus; Plecotus auritus
Faith Wilson	T202664	12/07/2005	Myotis daubentonii; Pipistrellus pipistrellus, Pipistrellus pygmaeus
Faith Wilson	T221700	12/07/2005	Nyctalus leisleri; Pipistrellus pipistrellus
Faith Wilson	T277801	2005-07-00	Pipistrellus pygmaeus
Faith Wilson	T2681	24/07/2009	Nyctalus leisleri; Pipistrellus pipistrellus, Pipistrellus pygmaeus;
Faith Wilson	T275829	2005-07-00	Myotis mystacinus/brandtii; Myotis spp, Nyctalus leisleri;
Faith Wilson	T216680	02/03/2006	Pipistrellus pipistrellus, Pipistrellus pygmaeus
Faith Wilson	T201676	13/07/2005	Nyctalus leisleri; Pipistrellus pipistrellus, Pipistrellus pygmaeus
NPWS Calls	T2256470324	16/10/2008	Plecotus auritus
NPWS Calls	T2293273830	03/04/2008	Pipistrellus pipistrellus

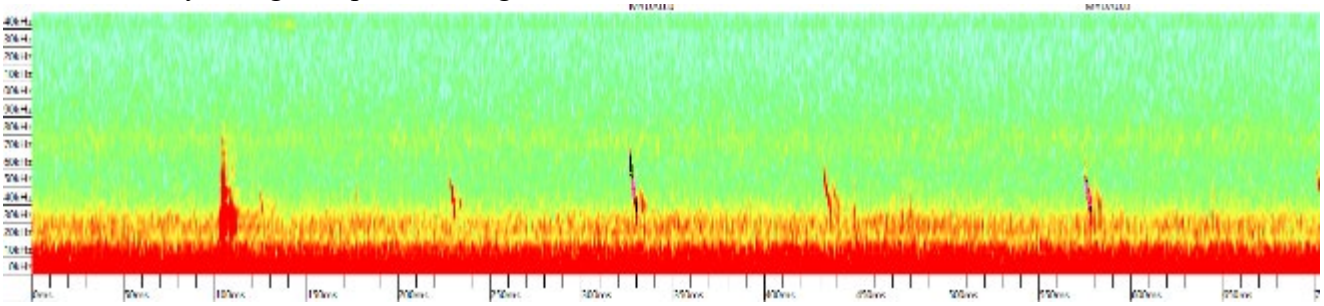
A search of Bat Conservation Ireland revealed no further roost sites. Discussions with Enda Mullen of NPWS confirmed the presence of pipistrelles several years previously at Arklow Castle (OSI Grid Reference T24252 73524). This was not noted to be a particular focal point for bat activity in 2016 and it may not serve as a major roost at present.

However, both post-dusk and pre-dawn surveying was concentrated on a different section of the town and roosting bats cannot be ruled out for this ruin.



Daubenton's bat at 18.20 hours at the bridge recording on Songmeter Mini (downriver of roost site) 17th November 2020

There was only a single sequence of signals from 16.25 to 18.30 hours



Daubenton's bat at 18.20 hours at the bridge recording on Echometer 3 (upriver of roost site) 17th November 2020

Appendix 10.4

Aquatic Ecology report

(App 11.6 of Arklow WwTP EIAR)

Plates

Plate 1: Otter spraint

Plate 2: Freshwater sample station S1

Plate 3: Freshwater sample station S2

Plate 4: Freshwater sample station S3

Plate 5: Freshwater sample station S4

Plate 6: Freshwater sample station S6

Plate 7: Freshwater sample station S7

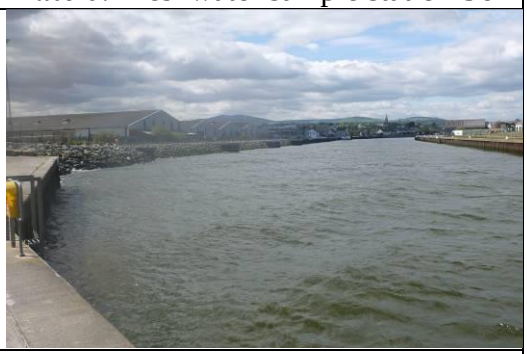


Plate 8: View upstream from breakwater

	
Plate 9: Cobble and pebble beach along estuary	**Plate 10:** Gravel banks just downstream of bridge

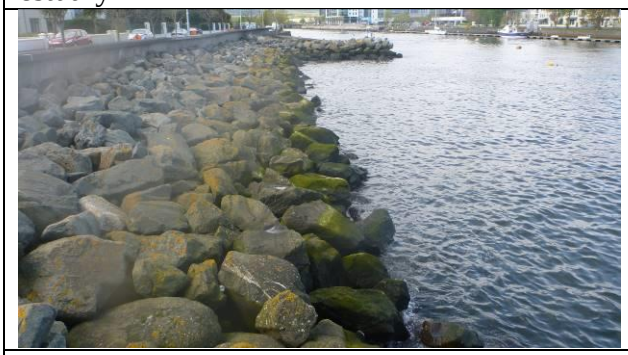



Plate 11: Rock armour showing algae and lichens	**Plate 12:** Sewage fungus at flap valve on the South Quay
	
Plate 13: Toilet paper & sanitary towel accumulation along the South Quay	

Tables

Table A1: Freshwater macroinvertebrates recorded from the Avoca River and Arklow Town Marsh channel on 26/09/2017. Species names checked by PESI Taxon Match Tool (http://www.eu-nomen.eu/portal/taxamatch.php).

EPA sensitivity group	Taxon	S1	S2	S3	S4	S5	S6	S7
	ANNELIDA							
	Oligochaeta							
E	Naididae (former Tubificoids)	-	-	-	1	-	-	-
C	*Lumbriculus variegatus*	600	16	85	47	30	16	14
	Hirudinea							
D	*Erpobdella octoculata*	-	-	-	-	-	2	-
D	*Glossiphonia complanata*	-	2	-	-	-	-	2
D	*Helobdella stagnalis*	-	-	-	-	1	-	-
	MOLLUSCA							
D	*Pisidium* sp.	-	-	20	2	22	2	8
D	*Physa fontinalis*	-	-	1	-	-	-	49
D	*Radix peregra*	-	-	-	-	-	-	122
	CRUSTACEA							
-	*Gammarus chevreuxi*	110	1	-	-	-	-	-
D	*Crangonyx pseudogracilis*	-	2	-	11	-	14	27
D	*Asellus aquaticus*	-	2	-	2	-	5	106
	INSECTA							
	Coleoptera							
C	*Oulimnius* sp. (adult)	-	-	1	1	-	-	-
C	*Oulimnius* sp. (larva)	-	6	-	-	1	1	-
C	*Haliplus confinis*	-	-	-	-	-	1	1
C	*Haliplus lineatocollis*	-	-	-	1	-	-	-
C	Haliplidae (larva)	2	2	-	-	-	-	2
C	*Stictotarsus duodecimpustulatus* (adult)	-	-	2	-	3	8	-
C	*Stictotarsus duodecimpustulatus* (larva)	-	-	-	1	-	-	-
C	*Nebrioporus elegans*	-	-	-	7	-	11	-
C	*Oreodytes sanmarkii*	-	-	-	-	1	1	-
C	*Ilybius fuliginosus*	-	-	-	-	-	1	-
C	*Ilybius* sp. (larva)	-	-	-	-	-	-	12
C	*Hydroporus tessellatus*	-	-	-	-	-	1	-
C	Hydroporinae (larva)	-	1	-	-	-	-	-
	Hemiptera							
C	*Sigara dorsalis* (nymph)	-	-	2	1	-	-	-
C	*Sigara dorsalis* (adult)	-	-	1	1	-	8	1
C	*Aquarius najas*	-	-	-	2	-	-	-
C	*Gerris* sp.	-	-	-	-	-	1	-
C	*Velia caprai*	-	-	-	-	1	-	-
C	*Notonecta viridis* (nymph)	-	-	-	-	-	1	-
C	*Notonecta viridis* (adult)	-	-	-	-	-	1	-
	Odonata							
B	*Calopteryx virgo*	-	-	-	1	-	2	-
B	*Pyrrhosoma nymphula*	-	-	-	1	-	1	-
	Diptera							
C	Chironomidae (larvae)	88	7	17	7	163	33	20
C	Chironomidae (pupa)	20	-	4	4	1	3	5
C	Tipulidae	1	-	-	-	-	-	-
-	Diptera indet	2	1	-	-	-	-	-
	Ephemeroptera							
C	*Baetis rhodani*	1	-	-	-	-	-	-
	Trichoptera							
B	*Mystacides azurea*	-	-	10	30	45	536	2
B	*Sericostoma personatum*	-	-	-	-	-	5	-
B	*Potamophylax latipennis*	-	-	-	-	-	2	-
B	Limnephilidae (instar II)	-	-	-	-	1	-	-
C	*Lype reducta*	-		1	-	1	-	-
C	*Holocentropus picicornis*		1	-	-	-	-	-
C	*Polycentropus flavomacalutus*	-	-	-	-	1	-	-
	ARACHNIDA							
	Araneae	-	-	-	-	-	1	1
	Hydracarina	2	-	-	-	1	-	2
	Total abundance	**826**	**41**	**144**	**120**	**272**	**657**	**374**
	Total number of taxa	**8**	**11**	**9**	**15**	**12**	**21**	**15**

Table A2: Field data recorded during the freshwater macroinvertebrate survey on the Avoca River on 26/09/2017.

Site no.	ITM_X	ITM_Y	Date	Surveyor	Dissolved O2 (mg/l)	Dissolved O2 (%)	Water temperature (°C)	pH	Conductivity (mS/cm)	Kick sample duration (mins)	Width (m)	Depth (m)
S01	724678	673454	26-09-17	JB/EV	9.2	90	14.4	7.25	0.1	2	160	0.25
S02	724424	673624	26-09-17	JB/EV	9.1	87	13.6	7.15	0.1	2	70	0.4
S03	724133	673608	26-09-17	JB/EV	9.1	88	14.1	7.21	0.1	2	40	0.3
S04	723873	673717	26-09-17	JB/EV	9.1	88	14.2	7.09	0.1	2	40	0.4
S05	723297	674131	26-09-17	JB/EV	9.3	91	14.6	7.12	0	2	40	0.4
S06	723111	674540	26-09-17	JB/EV	9.4	92	14.6	7.15	0.1	2	30	1.5
S07	723432	674393	26-09-17	JB/EV	5.4	54	15.6	6.86	0.2	1	4	0.3

Table A2: continued

Site no.	Flow	Discharge	Siltation	Silted	Water clarity	Habitats sampled	Vegetation	Filamentous algae	Slime	Sewage fungus
S01	Very slow	Normal	Slight	Generally	Slightly turbid	Margins	Open	Absent	Absent	Absent
S02	Very slow	Normal	Slight	Generally	Slightly turbid	Margins	Open	Present	Absent	Absent
S03	Very slow	Normal	Heavy	Generally	Slightly turbid	Margins	Partly shaded	Absent	Absent	Absent
S04	Very slow	Normal	Heavy	Generally	Slightly turbid	Margins	Partly shaded	Absent	Absent	Absent
S05	Very slow	Normal	Heavy	Generally	Slightly turbid	Margins	Shaded	Absent	Absent	Absent
S06	Very slow	Normal	Heavy	Generally	Slightly turbid	Margins	Partly shaded	Absent	Absent	Absent
S07	Stagnant	Normal	Heavy	Generally	Slightly turbid	Margins	Partly shaded	Absent	Absent	Absent

Table A2: continued

Site no.	Site location	Surrounding land
S01	Downstream Arklow Bridge, right bank	Urban
S02	Upstream Arklow Bridge, right bank	Left: Treeline and marsh, Right: Urban
S03	Upstream as railway curves away	Left: Treeline and marsh, Right: Path and waste ground
S04	Upstream Arklow Bridge, alongside railway	Left: Woodland, Right: Path, wasteground, railway
S05	Upstream of school, downstream of M11	Left: Woodland, Right: Woodland
S06	Upstream M11 Bridge, right hand side	Rough pasture/scrub
S07	Marsh backdrain downstream M11 Bridge	Swamp and pasture

Table A2: continued

Site no.	Bankside vegetation	In-stream vegetation/macrophytes (% cover)
S01	Concrete wall with *Taraxacum* sp., *Hedera hibernica* and *Rumex* sp.	None
S02	Left: *Salix* spp., *Ulex europaea* , *Fagus sylvatica* . Right: *Plantago lanceolata* , *Achillea millefolium* , *Festuca rubra* , *Holcus lanatus* ,	Filamentous algae 90%
S03	Right: *Salix cinerea* , *Ulex europaea* , *Holcus lanatus* , *Alnus glutinosa*	*Callitriche* sp. 40%, *Phalaris arundinacea* 10%
S04	Right: *Holcus lanatus* , *Rubus fruticosus* , *Betula pubescens* , *Senecio jacobaea* , *Daucus carota* , *Alnus glutinosa*	*Phalaris arundinacea* 1%, *Ranunculus* sp. 5%, *Callitriche* sp 5%
S05	Left: Woodland and *Fallopia japonica* and *Betula* sp., Right: *Acer*	0%
S06	*Agrostis stolonifera* , *Ranunculus repens* , *Rubus fruticosus* , *Alnus glutinosa* , *Ulex europaea* , *Plantago lanceolata* , *Holcus lanatus* , *Cytisus*	*Ranunculus* sp. 15%, *Callitriche* sp. 5%
S07	*Rubus fruticosus* , *Urtica dioica* , *Phalaris arundinacea*	*Sparganium erectum* 60%, *Apium nodiflorum* 10%, *Lemna* sp. 50%, *Phalaris arundinacea* 15%

Table A2: continued

Site no.	Substratum (% cover)	Other information (erosion, rubbish, etc.)
S01	Cobble 20%, Pebble 70%, Gravel 10%, Sand 10%	
S02	Boulder 50%, Cobble 30%, Gravel 10%, Sand 10%	Bank consists of large concrete blocks
S03	Boulder 20%, Silt 80%	Wall bank
S04	Silt 100%	
S05	Silt 100%	
S06	Silt/Clay 100%	
S07	Silt 100%	Channel choked with vegetation.

Table A3: Macroinvertebrates recorded during benthic survey at Arklow on 22/04/2017. Species names checked by PESI Taxon Match Tool (http://www.eu-nomen.eu/portal/taxamatch.php).

Species	Abundance (individuals per sample)													Total
	S1	S2	S3	S4	S5	S6	S7	S8	S9	S10	S11	S12	S13	
ANNELIDA														
Polychaeta														
Notomastus latericeus	3	3	2	5	10	3	20	-	-	-	-	-	-	46
Aphelochaeta sp.	-	-	-	-	-	-	3	2	-	-	-	-	-	5
Gonadia maculata	-	-	-	-	-	-	2	-	-	-	-	-	-	2
Glycera tridactyla	-	-	-	-	2	1	-	-	1	-	-	-	-	4
Ophelia borealis	-	-	-	-	-	-	-	-		1	-	-	-	1
Nephtys caeca	-	-	-	-	-	-	-	-	1	2	-	-	-	3
Nephtys hombergii	3	1	2	3	3	1	5	3	-	-	-	-	-	21
Nephtys assimilis	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Nephtys sp.	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Ampharete sp.	-	-	-	-	-	-	-	1	-	-	-	-	-	1
Ampharete lindstroemi	1	-	-	-	-	-	1	-	-	-	-	-	-	2
Pholoe inornata	-	-	-	2	1	1	3	2	-	-	-	-	-	9
Phyllodoce groenlandica	1	1	-	-	-	1	3	-	-	1	-	-	-	7
Sthenelais boa	-	-	-	-	-	-	1	3	-	-	-	-	-	4
Aphrodita aculeata	-	1	-	-	-	-	-	-	-	-	-	-	-	1
Owenia fusiformis	-		-	-	-	-	1	-	-	-	-	-	-	1
Spiophanes bombyx	-	14	1	-	-	-	3	-	-	-	-	-	-	18
Pectinaria koreni	-	-	-	-	-	-	4	-	-	-	-	-	-	4
Terebellidae sp	-	-	-	-	4	-	-	-	-	-	-	-	-	4
Heteromastus filiformis	-	-	3	-	-	-	-	-	-	-	-	-	-	3
Lumbrineris tetraura	-	-	-	-	-	-	1	-	-	-	-	-	-	1
Heteroclymene robusta	-	-	-	-	-	-	16	-	-	-	-	-	-	16
Oligochaeta														0
Enchytraeidae	-	-	-	-	-	-	-	-	-	-	-	2	255	257
CRUSTACEA														
Ampelisca brevicornis	-	1	-	2	1	-	6	1	-	-	-	-	-	11
Ampelisca tenuicornis	-	-	-	-	-	-	-	3	-	-	-	-	-	3
Ampelisca sp.	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Nototropis falcatus	-	-	-	-	-	-	-	-	-	1	-	-	-	1
Harpinia antennaria	-	1	-	-	-	-	-	2	-	-	-	-	-	3
Bathyporeia nana	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Gammarus chevreuxi	-	-	-	-	-	-	-	-	-	-	-	-	33	33
Gammarus sp.	-	-	-	-	-	-	-	-	-	-	-	-	1	1
ECHINODERMATA														
Amphiura incana	-	-	-	-	-	-	8	-	-	-	-	-	-	8
Amphipholis squamata	-	-	-	3	-	-	-	6	-	-	-	-	-	9
Ophiura ophiura	-	-	-	1	-	-	-	-	-	-	-	-	-	1
Ophiocten affinis	-	1	1	-	-	-	-	-	-	-	-	-	-	2
MOLLUSCA														
Pharus legumen	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Euspira catena	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Thracia phaseolina	1	-	-	-	-	-	-	-	-	-	-	-	-	1
Thyasira flexuosa	-	-	-	2	-	-	1	4	-	-	-	-	-	7
Nucula nitidosa	6	17	-	51	-	-	4	37	1	-	-	-	-	116
Abra alba	22	13	3	83	53	3	98	172	-	-	-	-	-	447
Modiolus modiolus	-	-	1	-	-	-	-	-	-	-	-	-	-	1
Pisidium sp.	-	-	-	-	-	-	-	-	-	-	-	-	1	1
NEMERTEA														
Nemertea indet.	2	1	-	1	-	-	1	9	-	-	-	-	-	14
ASCIDIACEA														
Ascidiacea indet.	-	-	-	-	-	-	-	-	1	-	-	-	-	1
HEXACORALLIA														
Hexacorallia indet.	-	-	-	-	-	-	-	-	1	-	-	-	-	1
INSECTA														
Coleoptera														
Limnius volckmari	-	-	-	-	-	-	-	-	-	-	1	1	-	2
Diptera														
Diptera indet.	-	-	-	-	-	-	-	-	-	-	-	1	-	1
Total individuals	**40**	**54**	**13**	**153**	**74**	**11**	**181**	**245**	**8**	**6**	**1**	**4**	**290**	**1077**
Total species	9	11	7	10	7	7	19	13	8	5	1	3	4	49

Table A4: Field data recorded during the estuarine and marine benthic survey at Arklow on 22/04/2017.

Sample station	Date	Time	Weather	Sea State	Exposure	Depth (m)	Salinity	Bite depth (cm)	Sediment description
								11	Muddy sand
1	22-04-17	10:05	Overcast	2	Moderately exposed	10.5	30	-	-
								7	Fine sand, no RPD, shells
2	22-04-17	11:15	Overcast	2	Moderately exposed	11	31.1	7	Fine sand, no RPD, shells
								8	Coarse sand, fine sand, clay, no RPD
3	22-04-17	9:15	Overcast	2	Moderately exposed	8.2	-	-	-
								7	Fine sand, mud, shelly, RPD 1cm
4	22-04-17	10:25	Overcast	2	Moderately exposed	12.4	31.1	7	Fine sand, mud, shelly, RPD 1cm, brittlestar
								13	Sandy mud, RPD 1 cm
5	22-04-17	9:40	Overcast	2	Moderately exposed	11.2	29.5	13	Sandy mud, RPD 1 cm
								7	Sand, very shelly, no RPD
6	22-04-17	11:20	Overcast	2	Moderately exposed	11.7	30.8	-	-
								7	Fine sand, RPD 0.5 cm
7	22-04-17	9:25	Overcast	2	Moderately exposed	12	27.6	7.5	Fine sand, RPD 0.5 cm
								12	Sandy mud, RPD 0.5 cm, worms
8	22-04-17	10:40	Overcast	2	Moderately exposed	12.5	30.6	-	-
								7	Sand, no RPD, anemone & razor clam
9	22-04-17	11:35	Overcast	2	Moderately exposed	12.5	31.4	-	-
								7	Sand, very shelly, no RPD, Lanice casts
10	22-04-17	12:20	Overcast	2	Moderately exposed	8.1	31.4	-	-
								13	Mud, highly anoxic, RPD 0 cm, fungus, leaves
11	22-04-17	8:40	Overcast	0	Sheltered	3.8	1.3	-	-
								8	Leaf litter, H_2S0_4
12	22-04-17	8:30	Overcast	0	Sheltered	1.9	1.3	6	Leaf litter, H_2S0_4
								5	Gravel, pebbles, poorly sorted, no RPD
13	22-04-17	8:10	Overcast	0	Sheltered	1	1.1	8	Gravel, pebbles, poorly sorted, no RPD

Table A5: Results of sediment analysis of samples taken on 22/04/2017

Station	% LOI	% ret on 2mm	% ret on 1mm	% ret on 0.5mm	% ret on 0.25mm	% ret on 0.125mm	% ret on 0.063mm	% <0.063mm	Textural Group
		Very Fine Gravel	Very Coarse Sand	Coarse Sand	Medium Sand	Fine Sand	Very Fine Sand	Silt	(Gradistat)
1	2.38	0.2	2.8	2.2	13.6	33.2	6.3	41.6	Slightly Gravelly Muddy Sand
2	0.15	0.3	0.7	2.5	45.2	50.2	0.8	0.4	Slightly Gravelly Sand
3	0.94	9	8.8	5.9	6.4	32.5	1.8	35.6	Gravelly Muddy Sand
4	1.80	1.1	0.8	1	28.3	47.4	4.1	17.3	Slightly Gravelly Muddy Sand
5	3.13	1.6	2.5	3.7	11.8	21	6.8	52.6	Slightly Gravelly Sandy Mud
6	0.73	18.5	8.9	9.7	14.6	35.2	3.6	9.6	Gravelly Muddy Sand
7	1.12	1.6	2.1	2.1	13.2	50.8	4.7	25.6	Slightly Gravelly Muddy Sand
8	2.67	0.6	1.1	1.9	21.3	26.5	7.2	41.4	Slightly Gravelly Muddy Sand
9	0.36	0.1	0.5	1	56.6	41.8	0	0	Slightly Gravelly Sand
10	0.59	2.7	7.1	11.8	57.9	18.5	0.1	1.9	Slightly Gravelly Sand
11	13.54	0	0	0	0	0	3	97	Mud
12	78.04	0	0	0	0	0	0	0	N/A
13	0.56	72.1	23.3	4.4	0.1	0.1	0	0	Sandy Gravel

Appendix 10.5

European Site Synopsis Reports

(See NIS Appendix 3 below)

Appendix 10.6

Arklow Town Marsh pNHA

Site Synopsis Report

(see NIS Appendix 1 above)

Appendix 10.7

Arklow Bridge

Bryophyte Survey

ARKLOW BRIDGE, ARKLOW, CO. WICKLOW
BRYOPHYTE SURVEY

November 2020

Report produced by Denyer Ecology for:
Aquafact

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CONTENTS

1 INTRODUCTION

1.1 Background

Denyer Ecology was commissioned by Aquafact to undertake a bryophyte survey of Arklow Bridge, Arklow, Co. Wicklow. This survey was requested by NPWS in relation to proposed bridge renovation works. Although there were a number of bryophyte records from Arklow town (1975), there were no recent records from the town and no records localised to the bridge. The potential to support a bryophyte flora of conservation interest was unknown.

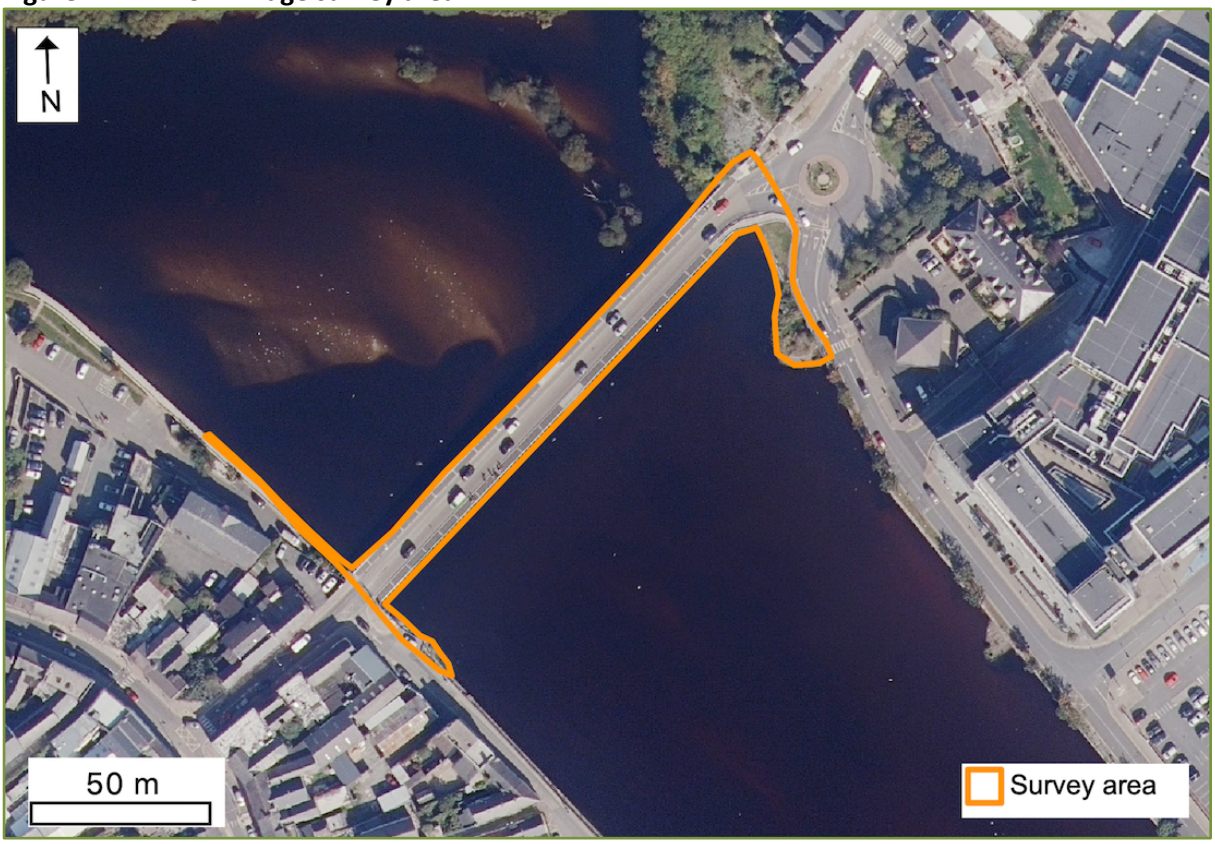
1.2 Aims

The aim of the survey was to undertake a bryophyte survey of all accessible areas of the bridge to determine whether the site supports/ has the potential to support any bryophytes of conservation interest. This included aquatic, terrestrial and saxicolous bryophyte species.

1.3 Site

The site location is shown in Figure 1.1. The project area includes accessible areas of the bridge and adjacent watercourse edge. The bryophyte habitats surveyed include aquatic species on stonework and stones below high tide level, saxicolous species on the bridge above high tide level and terrestrial species on disturbed soil adjacent to the watercourse at the high tide level.

Figure 1.1. Arklow Bridge survey area



RGB Aerial Photography - © Bluesky Geospatial Limited

2 METHODOLOGY

2.1 Desktop information

The following resources were consulted:

- GIS boundaries of designated site data (data accessed via NPWS website).
- Aerial photography (Bing maps and Blusky mapping).
- British Bryological Society Atlas of British and Irish bryophytes (Blockeel et al., 2014a & 2014b).

- British Bryological Society Atlas dataset

2.2 Bryophyte survey

The site was walked over by an experienced bryologist in November 2020. The site survey area is shown on Figure 1.1. All accessible areas of the site that were considered of potential interest for bryophytes were surveyed (see also Section 2.6 'Limitations' below). All bryophytes encountered in the field were recorded on a recording card.

2.3 Identification of specimens

Any specimens that could not be identified in the field, or required confirmation, were collected and examined using a microscope.

2.4 Ecological evaluation

The rarity (local and national) and legal protection of the bryophytes recorded from the site were assessed using a number of resources:

- Flora (Protection) Order, 2015.
- Ireland Red List No. 8. Bryophytes: Mosses, Liverworts & Hornworts (Lockhart et al., 2012a).
- British Bryological Society Atlas of British and Irish bryophytes (Blockeel et al., 2014a & 2014b).
- British Bryological Society Atlas dataset.

2.5 Plant species nomenclature

The bryophyte nomenclature adopted by Blockeel et al. (2014a & b) is used; this is based on the *Checklist of British and Irish bryophytes* (Hill et al., 2009) with minor modifications to reflect recent taxonomic changes. Note that a new checklist is due to be published in early 2021 and some of the names included in this report will be changed.

2.6 Limitations

There were limitations on accessing the stonework of the bridge:

- The site was visited at low tide, but the water levels and flow were still too high to access the bridge arches within the river channel. These were viewed with binoculars and similar stonework up and downstream of the bridge was surveyed to assess the typical bryophyte flora present at the site. As the stonework of the bridge below the high tide level has very little bryophyte cover, this was not considered to limit the survey results.
- The top surface of the bridge comprises concrete with railings on either side of the footpath. It was possible to view the top side of the concrete through the railings. There was very little bryophyte cover on the stonework below the concrete layer.

3 SURVEY RESULTS AND DISCUSSION

3.1 Bryophyte habitats

The main bryophyte habitats present at the site are:

- concrete at the top of the bridge on either side (above high tide level) (Photographs 3.1 to 3.4);
- bridge stonework (below high tide level) Photographs 3.5 to 3.6);
- walls and stonework at the edge of the river upstream and downstream of the bridge (between low and high tide levels) (Photographs 3.7 to 3.8);
- disturbed soil at the edges of the riverbank below the bridge (at high tide level) (Photographs 3.9 and 3.10).

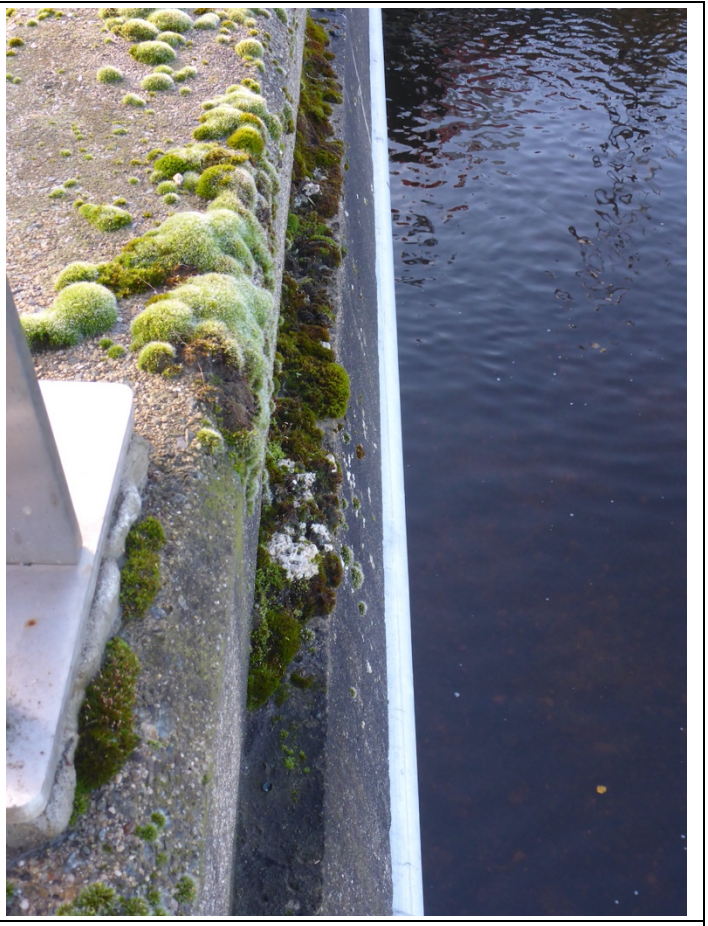
3.2 Bryophyte species

Details of all bryophyte species recorded, their abundance at the site and local and national rarity are given in Table 3.1.

A total of 19 bryophytes were recorded during the survey. These were all mosses, and no liverworts were recorded. This is relatively low diversity for a large old stone bridge and lowland river in Ireland. Much of the bridge stonework did not support bryophytes and it may be that either the bridge has been cleaned in the past or the stone is smooth and offers little hold potential for mosses. The top stonework of the bridge has been replaced with concrete and this was dominated by a few species typical of urban, calcareous, relatively smooth surfaces. There were few aquatic mosses, and this may be due to the tidal nature of the river in this location and slightly brackish water.

County Wicklow has a diverse bryophyte flora for an eastern Irish county, mainly due to the presence of a range of upland habitats. Some sites and habitats have been very well recorded for bryophytes, but urban and lowland habitats have been as well recorded. Four species were recorded from Arklow bridge that have less than 10 records within Co. Wicklow (Vice County H20). These are: *Didymodon nicholsonii, Leptodictyum riparium, Syntrichia laevipila* and *Syntrichia montana.* These are species of lowland urban or lowland river habitats and all are widespread nationally and it is considered that they are under-recorded within Co. Wicklow, rather than genuinely rare. *Didymodon nicholsonii* was recorded upstream of the bridge; *Leptodictyum riparium* from both sides of the river downstream of the bridge; and both *Syntrichia* species from side concrete at the very western end of the bridge, near to the roundabout.

Photographs 3.1-3.10

Photograph 3.1. Bryophytes frequent on top concrete of bridge (W side of bridge). *Grimmia pulvinata* is dominant on the drier top surface and *Schistidium crassipilum* on the lower, slightly more shaded concrete. W side of bridge.	
Photograph 3.2. *Grimmia pulvinata* on top surface of concrete on bridge. W side of bridge.	

Photograph 3.3. *Schistidium crassipilum* and *Orthotrichum anomalum* on the side of the concrete surface at top of bridge. W side of bridge.	
Photograph 3.4. *Syntrichia latifolia* and *Syntrichia ruralis* on concrete at the N end of W side of the bridge.	
Photograph 3.5. Stonework on bridge arches (above high tide) has little/ no bryophyte cover. E side of bridge.	

Photograph 3.6. Stonework on bridge arches (below high tide) has little/ no bryophyte cover. Red arrows show the small amount of aquatic moss *Fontinalis antipyretica*. E side of bridge.	
Photograph 3.7. Absence of aquatic bryophytes on stonewall and gravel downstream of bridge. Red arrow indicates high tide level. N bank of the river.	
Photograph 3.8. Concrete wall and stonework at the edge of the river, downstream of the bridge. Bryophytes locally frequent and dominated by urban species of walls and disturbed ground. S bank of the river.	

Photograph 3.9. The aquatic moss *Fontinalis squamosa* (red arrow) on gravel downstream of the bridge, between the high and low tide levels. N bank of the river.	
Photograph 3.10. The aquatic moss *Leptodictyum riparium* growing below high tide level on soil between boulders downstream of the bridge. S bank of river.	

Table 3.1. Arklow Bridge bryophyte species list

Species	Group	Red List*	Distribution within site	Distribution nationally	Distribution locally (H20)
Brachythecium rivulare	Moss	LC	Occasional on soil/ grassy areas downstream of bridge	Widespread	Widespread
Bryum argenteum	Moss	LC	Frequent on concrete of bridge and footpath	Widespread	Widespread
Bryum capillare	Moss	LC	Frequent on concrete of bridge and also just above high tide water mark on inside of bridge arches	Widespread	Widespread
Bryum dichotomum	Moss	LC	Frequent on stonewalls and soil at the edges of the river, up and downstream of bridge. Locally frequent on stonewall just above high tide line upstream of the bridge.	Widespread	Widespread
Didymodon insulanus	Moss	LC	Occasional on concrete	Widespread	Widespread
Didymodon nicholsonii	Moss	LC	Occasional on damp concrete and on stonewall just above high tide line upstream of the bridge.	Widespread	Occasional: <10 records
Didymodon rigidulus	Moss	LC	Frequent on concrete of bridge	Widespread	Widespread
Fontinalis antipyretica	Moss	LC	Occasional on inside of bridge arches, between the low and high tide water levels. Occasional on stones at the edge of the river, downstream of the bridge.	Widespread	Widespread
Fontinalis squamosa	Moss	LC	Present in one location on stones between high and low tide level, downstream of the bridge.	Frequent in N and W and upland areas, rare in midlands	Widespread
Grimmia pulvinata	Moss	LC	Frequent to abundant on concrete on bridge. The most frequent bryophyte on the top and east facing drier concrete habitat.	Widespread	Widespread
Leptodictyum riparium	Moss	LC	Occasional on stones between low and high tide downstream of the bridge on both sides of the river	Widespread	Rare: <5 records
Orthotrichum anomalum	Moss	LC	Frequent on concrete of bridge	Widespread	Widespread
Oxyrrhynchium hians	Moss	LC	Occasional on damp soil just above high tide level downstream of the bridge	Widespread	Widespread
Platyhypnidium riparioides	Moss	LC	Occasional on stones between low and high tide downstream of the bridge on both sides of the river. None recorded on bridge.	Widespread	Widespread
Schistidium crassipilum	Moss	LC	Frequent on concrete of bridge	Widespread	Widespread
Syntrichia latifolia	Moss	LC	Occasional on soil accumulated on concrete at the northern end of the bridge	Widespread	Rare: <5 records
Syntrichia montana	Moss	LC	Occasional on concrete of bridge	Widespread	Occasional: <10 records
Syntrichia ruralis var. ruralis	Moss	LC	Occasional on soil accumulated on concrete at the northern end of the bridge and on soil downstream of the bridge	Widespread	Widespread
Tortula muralis	Moss	LC	Frequent on concrete of bridge	Widespread	Widespread

*LC = Least Concern

4 CONCLUSIONS AND RECOMMENDATIONS

The main habitats for bryophytes within the survey area were the concrete on top of the bridge (above high tide level), stonework up and downstream of the bridge (at high tide level) and (to a lesser extent) the bridge stonework between high and low tide level (aquatic moss species).

The bridge and adjacent habitats had relatively **low bryophyte species diversity** with a total of 19 mosses recorded. None of these species are nationally rare or listed on the Flora (Protection) Order. Four species which have less than 10 records within County Wicklow were recorded. However, these are widespread and common species, which are likely to be under-recorded in Co. Wicklow. **It is not considered that the bridge supports a bryophyte flora of conservation interest.** However, it does support moderate to high bryophyte cover in some areas (e.g. the top concreate) and it is recommended that bryophyte cover be retained where possible. Where bryophytes do need to be removed from a surface, the surface should be replaced with similar material and the use of very smooth surfaces should be avoided. Urban and aquatic bryophytes tend to quickly re-colonise surfaces as long as there is some texture to the surface.

REFERENCES

BBS (2009). *Checklist of British and Irish bryophytes*. The British Bryological Society, Stafford, U.K.

Blockeel, T.L., Bosanquet, S.D.S. Bosanquet, Hill, M.O. and Preston, C.D. (2014a). *Atlas of British and Irish bryophytes.* Volume 1. British Bryological Society (Pisces Publications, Newbury).

Blockeel, T.L., Bosanquet, S.D.S. Bosanquet, Hill, M.O. and Preston, C.D. (2014b). *Atlas of British and Irish bryophytes.* Volume 2. British Bryological Society (Pisces Publications, Newbury).

Bosanquet, S. (2009). Identification: *Orthotrichum* – Britain's bristle-mosses. *British Wildlife*: 20 (3) 187-194.

Lockhart, N., Hodgetts, N. & Holyoak, D. (2012a). *Ireland Red List No.8: Bryophytes*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Lockhart, N., Hodgetts, N. & Holyoak, D. (2012b). *Rare and threatened Bryophytes of Ireland.* National Museums of Northern Ireland, Holywood.

Screening Statement for Appropriate Assessment and Natura Impact Statement

Appendix 3

European Site Synopsis Reports

NIS Appendix 3

European Site Synopsis Reports

SITE SYNOPSIS

SITE NAME: THE MURROUGH SPA

SITE CODE: 004186

The Murrough SPA comprises a coastal wetland complex that stretches for 13 km from Kilcoole Station, east of Kilcoole village in the north to Wicklow town in the south, and extends inland for up to 1 km in places. The site includes an area of marine water to a distance of 200m from the low water mark. A shingle ridge runs along the length of the site and carries the Dublin-Wexford railway line.

Beside the shingle shore is a stony ridge supporting perennial vegetation. Driftline vegetation on the seaward side includes species such as Sea Rocket (*Cakile maritima*), Sea Sandwort (*Honkenya peploides*), Sea Holly (*Eryngium maritimum*) and Yellow-horned Poppy (*Glaucium flavum*). Low sand hills occur at Kilcoole, with Marram (*Ammophila arenaria*) and Lyme-grass (*Leymus arenarius*). In other areas and further inland a rich grassy sward, which is most extensive in the south end of the site, has developed. A community dominated by Silverweed (*Potentilla anserina*) and Strawberry Clover (*Trifolium fragiferum*) occurs in some of the wetter, grassy areas. In some places, particularly at the south of the site, a Gorse (*Ulex*) heath has developed on the stony ridge.

At the southern end of the site, Broad Lough, a brackish, partly tidal lake, has a well-developed saltmarsh community. Common Reed (*Phragmites australis*) is abundant along the western shore, along with some Sea Club-rush (*Scirpus maritimus*). Saltmarsh is also present in the northern end of the site in the vicinity of the Breaches. An area of fen occurs at Five Mile Point. Here, Black Bog-rush (*Schoenus nigricans*) is dominant. Fen Sedge (*Cladium mariscus*) is present where the ground is wetter. This merges into areas dominated by Common Reed. A wide range of freshwater and brackish marsh habitats occur within the site. These vary from reed-marsh dominated by reeds and rushes (*Juncus* spp.), to those of sedges (*Carex* spp.) with other areas supporting a mixture of sedges and Yellow Iris (*Iris pseudacorus*) also occurring. The marshes merge into wet grassland in many areas and where grazing pressure is low, a herb-rich sward occurs. Sedges are abundant in the wetter areas. Where drains have been cut, there are many other species such as Greater Spearwort (*Ranunculus lingua*), Bogbean (*Menyanthes trifoliata*) and Reed Sweet-grass (*Glyceria maxima*).

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Red-throated Diver, Greylag Goose, Light-bellied Brent Goose, Wigeon, Teal, Black-headed Gull, Herring Gull and Little Tern. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The shingle ridge at Kilcoole is a traditional nesting area for Little Tern, and the site now supports one of the largest colonies in the country. Numbers vary between years,

with 36 pairs recorded in 1995 and 106 pairs in 2006. A tern protection scheme and research programme, co-ordinated by BirdWatch Ireland and the National Parks and Wildlife Service, has been in operation since 1985. Breeding success varies from year to year, largely due to predation by foxes, crows and other species.

During the winter this site is important for a number of waterbirds - all population sizes are the mean of peak counts for the 5 years, 1995/96 – 1999/2000. Light-bellied Brent Goose occurs here in internationally important numbers (859). Other species that visit here in nationally important numbers are Red-throated Diver (32), Greylag Goose (300), Wigeon (1,209), Teal (644), Black-headed Gull (997) and Herring Gull (506). Other species that are known to occur here are Little Grebe, Grey Heron, Cormorant, Mute Swan, Whooper Swan, Greenland White-fronted Goose, Shelduck, Gadwall, Shoveler, Mallard, Golden Plover, Ringed Plover, Lapwing, Dunlin, Curlew, Greenshank and Redshank.

Short-eared Owl is recorded here during the winter. Little Egret has bred locally in recent years and this site is a main feeding area, with several birds present regularly. While formerly a rare bird in Ireland, Little Egret is now well-established with most birds occurring in the south-east and south (Counties Wexford, Waterford and Cork). The Murrough is presently at the edge of the species' range. This site is one of the few sites in Ireland where Reed Warbler breeds regularly. It is considered that 1-4 pairs bred each year during the 1980s and early 1990s, with a minimum of 6 birds in song in 1993. An absence of records since 1996 may be due to under-recording. Kingfisher regularly uses the site. Sandwich Tern are recorded from the site during the autumn.

The Murrough SPA is an important site for wintering waterbirds, being internationally important for Light-bellied Brent Goose and nationally important for Red-throated Diver, Greylag Goose, Wigeon, Teal, Black-headed Gull and Herring Gull. It is probably the most important site in the country for nesting Little Tern. The regular occurrence of Red-throated Diver, Little Egret, Whooper Swan, Greenland White-fronted Goose, Golden Plover, Little Tern, Sandwich Tern, Short-eared Owl and Kingfisher is of note as these species are listed on Annex I of the E.U. Birds Directive. Part of the Murrough SPA is a Wildfowl Sanctuary.

15.5.2015

SITE SYNOPSIS

SITE NAME: CAHORE MARSHES SPA

SITE CODE: 004143

Cahore Marshes SPA is located just south of Cahore Point on the north Co. Wexford coast. It comprises an area of polder grassland and some arable land interspersed by canals and drainage channels. The drainage canals and sluices were installed in the mid 19th century to reclaim wetlands and land that flooded regularly behind the sand dunes. Seawater may occasionally enter the channels and create brackish conditions. The area is underlain by rocks of Cambrian age.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Greenland White-fronted Goose, Wigeon, Golden Plover and Lapwing. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The Cahore Marshes SPA is of ornithological importance as a site for wintering waterfowl. An internationally important population of Greenland White-fronted Goose (634 - five year mean peak counts for the period 1994/95 to 1998/99), which is part of the flock that is based at Wexford Harbour, utilises this site during the winter. Both Whooper Swan (23) and Bewick's Swan (12) also occur, but in relatively low numbers - all figures are mean peak counts for four of the five winters between 1995/96 and 1999/2000. Bewick's Swan had been more numerous in the 1980s, especially in spring, but numbers have declined in line with a national decrease. The site supports nationally important populations of a further three species - Wigeon (1,661), Golden Plover (6,038) and Lapwing (3,455). The Golden Plover population is of particular note as it is represents almost 4% of the all-Ireland population. The site also holds other wintering waterbirds, in smaller numbers, including Shelduck (28), Teal (417), Mallard (244), Shoveler (40), Curlew (635) and Black-headed Gull (326). The site provides excellent feeding for these species, as well as good roost/rest areas.

The Cahore Marshes SPA is of considerable ornithological importance as it provides a feeding area for an internationally important population of Greenland White-fronted Goose. It also holds nationally important populations of three other species. The regular occurrence of Greenland White-fronted Goose, Bewick's Swan, Whooper Swan and Golden Plover is of particular note as these species are all listed on Annex I of the E.U. Birds Directive.

18.5.2010

SITE SYNOPSIS

SITE NAME: POULAPHOUCA RESERVOIR SPA

SITE CODE: 004063

Poulaphouca Reservoir SPA, located in the western foothills of the Wicklow Mountains, was created in 1944 by damming of the River Liffey for the purpose of generating electricity from hydropower. The reservoir covers an area of approximately 20 square kilometres and is the largest inland water body in the mid-east and south-east regions. The reservoir receives water from two main sources, the River Liffey at the northern end, and the Kings River at the southern end. The exit is into the River Liffey gorge at the western end. Underlying the reservoir are sands and gravels deposited during the last glaciation. The shores of the lake are mostly sandy. When water levels are low the exposed lake muds are colonised by an ephemeral flora of annual plant species. Wet grassland areas occur in sheltered bays around the lake but especially in the northern part. Reed Canary-grass (*Phalaris arundinacea*) is the main grass species present, but other plant species characteristic of wet grasslands occur, including Creeping Bent (*Agrostis stolonifera*), Meadowsweet (*Filipendula ulmaria*), Yellow Iris (*Iris pseudacorus*) and Water Mint (*Mentha aquatica*). Sedges (*Carex* spp.) are locally common, while Rusty Willow (*Salix cinerea* subsp. *oleifolia*) scrub is often found associated with the wet grassland. In some places the water washes against grassy banks which are generally less than a metre high, and in a few places there are steep sand and clay cliffs, up to 15 m high - these are remnants of the old River Liffey channel. In many places the banks are actively eroding, and a strip of conifers has been planted around much of the perimeter of the reservoir in an attempt to stabilize the banks.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Greylag Goose and Lesser Black-backed Gull.

Poulaphouca Reservoir is of national importance for its Greylag Goose population, which is one of the largest in the country. The site provides the main roost for the birds, with feeding occurring mostly on improved grassland outside of the site. A mean peak of 701 individuals occurred during the five seasons 1995/96 to 1999/2000. Other waterfowl species occur in relatively low numbers, including Whooper Swan (22), Wigeon (180), Teal (107), Mallard (186), Goldeneye (22), Cormorant (11), Great Crested Grebe (8), Curlew (86) and Mute Swan (11). The site is also used by Grey Heron (6).

The reservoir attracts roosting gulls during winter, most notably a large population of Lesser Black-backed Gull (651), which in Ireland is rare in winter away from the south coast. Black-headed Gull (915) and Common Gull (183) also occur.

Breeding birds at the site include Great Crested Grebe (several pairs), which is localised in its distribution in eastern Ireland, as well as Snipe and Lapwing.

The principal interest of the site is the Greylag Goose population, which is of national importance. A range of other wildfowl species also occurs, including Whooper Swan, a species that is listed on Annex I of the E.U. Birds Directive. The site is also notable as a winter roost for gulls, especially Lesser Black-backed Gull. Part of Poulaphouca Reservoir SPA is a Wildfowl Sanctuary.

8.7.2014

SITE SYNOPSIS

SITE NAME: WEXFORD HARBOUR AND SLOBS SPA

SITE CODE: 004076

Wexford Harbour is the lowermost part of the estuary of the River Slaney, a major river that drains much of the south-east region. The site is divided between the natural estuarine habitats of Wexford Harbour, the reclaimed polders known as the North and South 'Slobs', and the tidal section of the River Slaney. The seaward boundary extends from the Rosslare peninsula in the south to the area just west of The Raven Point in the north. Shallow marine water is a principal habitat, but at low tide extensive areas of intertidal flats are exposed. These vary from rippled sands in exposed areas to sandy-muds in the more sheltered areas, especially at Hopeland and the inner estuary to the west of Wexford bridge. The flats support a rich macro-invertebrate fauna, including the bivalves Cockle (*Cerastoderma edule*), Baltic Tellin (*Macoma balthica*) and Peppery Furrow-shell (*Scrobicularia plana*), the polychaetes Lugworm (*Arenicola marina*), Catworm (*Nepthys hombergi*) and Ragworm (*Hediste diversicolor*) and the crustacean *Corophium volutator*. Beds of mussels (*Mytilus edulis*) also occur. Salt marshes fringe the intertidal flats, especially in the sheltered areas such as Hopeland and towards Castlebridge. The Slobs are two flat areas of farmland, mainly arable and pasture grassland, empoldered behind 19th century sea-walls. The lands are drained by a network of channels which flow into two central channels, in parts several hundred metres in width. Water from the channels is pumped into the sea with electric pumps. The channels often support swamp vegetation. The river section of the site is extensive, extending to Enniscorthy, a distance of almost 20 km from Wexford town. It is noticeably tidal as far as Edermine Bridge but with tidal influence right up to Enniscorthy. In places, such as the Macmine marshes, it is several hundreds metres wide and here reedswamp is well developed.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Bewick's Swan, Whooper Swan, Greenland White-fronted Goose, Light-bellied Brent Goose, Shelduck, Wigeon, Teal, Mallard, Pintail, Scaup, Goldeneye, Red-breasted Merganser, Hen Harrier, Coot, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Knot, Sanderling, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Black-headed Gull, Lesser Black-backed Gull and Little Tern. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The site is of international importance for several species of waterbirds but also because it regularly supports well in excess of 20,000 waterbirds (average peak of 49,030 for the 5 winters 1996/97-2000/01). Wexford Harbour and Slobs is one of the top three sites in the country for numbers and diversity of wintering birds. The

combination of estuarine habitats, including shallow waters for grebes, diving duck and seaduck, and the farmland of the polders, which include freshwater drainage channels, provides optimum feeding and roost areas for a wide range of species. Of particular importance is that it is one of the two most important sites in the world for Greenland White-fronted Goose (9,353) (all given figures for species are average peaks for the 5 winters 1995/96-1999/00). The geese feed almost entirely within the Slobs and roost at The Raven (a separate SPA). The site also has internationally important populations of Mute Swan (543), Light-bellied Brent Goose (1,469), Bar-tailed Godwit (1,696) and Black-tailed Godwit (790).

There are at least a further 26 species of wintering waterbirds which occur in numbers of national importance, i.e. Great Crested Grebe (117), Little Grebe (82), Cormorant (495), Grey Heron (52), Whooper Swan (100), Bewick's Swan (191), Shelduck (753), Wigeon (2,752), Teal (1,538), Mallard (3,290), Pintail (66), Scaup (339), Goldeneye (182), Red-breasted Merganser (209), Coot (351), Oystercatcher (1,493), Golden Plover (5,013), Grey Plover (1,279), Lapwing (11,826), Knot (453), Sanderling (210), Dunlin (2,485), Curlew (1,771), Redshank (555), Black-headed Gull (5,977) and Lesser Black-backed Gull (1,086). Other species that use the site include Ringed Plover (69), Turnstone (41), Greenshank (12), Shoveler (24), Tufted Duck (114), Pochard (218), Common Gull (100+) and Little Egret. Several of the above populations represent substantial proportions of the national totals, especially Shelduck (5.2%), Scaup (5.3%), Red-breasted Merganser (5.7%) and Grey Plover (19.9% and the top site in the country). The Slobs is the most important and indeed one of the few sites in the country which supports a regular flock of Bewick's Swan. Numbers of wintering birds are often swelled by hard-weather movements from Britain and Europe, notably Golden Plover and Lapwing.

The site is a regular location for scarce passage waders such as Ruff, Spotted Redshank and Green Sandpiper, as well as Curlew Sandpiper in varying numbers. The rare Wood Sandpiper is seen each year, mainly in autumn.

Short-eared Owl and Hen Harrier are regular visitors to the Slobs during winter. Of particular note is the presence of a Hen Harrier communal roost site with a five year mean peak count of 5 birds (2005/06 to 2009/10).

The site is important for Little Tern as it has can hold a nationally important breeding colony (12 pairs in 1995 and 30 pairs in 2000). The Slobs support a nesting colony of Tree Sparrow, a very localised species in Ireland that is listed in the Irish Red Data Book. Another very localised breeding species, Reed Warbler, is well established within the swamp vegetation along the River Slaney and on the South Slob (estimated as at least 10 pairs).

A range of duck species breed, including Teal, Tufted Duck and, probably in most years, Shoveler.

Wexford Harbour and Slobs SPA is one of the most important ornithological sites in the country supporting internationally important populations of Greenland White-fronted Goose, Light-bellied Brent Goose, Black-tailed Godwit and Bar-tailed Godwit. In addition, it has 26 species of wintering waterbirds with populations of

national importance and nationally important numbers of breeding Little Tern. Also of significance is that several of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Little Egret, Whooper Swan, Bewick's Swan, Greenland White-fronted Goose, Hen Harrier, Golden Plover, Bar-tailed Godwit, Ruff, Wood Sandpiper, Little Tern and Short-eared Owl. The site is an important centre for research, education and tourism. Wexford Wildfowl Reserve, located within Wexford Harbour and Slobs SPA, is a Ramsar Convention site, a Biogenetic Reserve and a Statutory Nature Reserve. Parts of the Wexford Harbour and Slobs SPA are also designated as Wildfowl Sanctuaries.

8.7.2014

SITE SYNOPSIS

SITE NAME: IRELAND'S EYE SPA

SITE CODE: 004117

Ireland's Eye is an uninhabited island located about 1.5 km north of Howth in Co. Dublin. The site encompasses Ireland's Eye, Rowan Rocks, Thulla, Thulla Rocks, Carrageen Bay and a seaward extension of 200m in the west and 500m to the north and east. The island has an area of *c*. 24 ha above the high tide mark. The underlying geology is Cambrian greywackes and quartzites. These rocks form impressive near-vertical cliffs, reaching 69 m, along the northern and eastern sides of the island, with scattered exposures elsewhere on the island and especially in the high northern half. A tall stack, which is completely cut off from the main island at mid to high tide, occurs at the eastern side of the cliffs. A sandy beach, backed by low sand hills, occurs at Carrigeen Bay on the western shore, while a shingle beach extends from Carrigeen to Thulla Rocks. Elsewhere the island is covered by glacial drift. A low-lying, sparsely vegetated islet, known as Thulla, occurs a little to the south of the island, and an extensive area of bedrock shore (heavily covered by brown seaweeds) is exposed at low tide between Thulla and the main island. There are no watercourses or springs on the island, though two small rainwater ponds form during winter in the north-west and north-east sectors.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Cormorant, Herring Gull, Kittiwake, Guillemot and Razorbill.

Ireland's Eye has important populations of breeding seabirds. In 1999 the following species were recorded: Fulmar (70 pairs), Gannet (147 pairs), Cormorant (306 pairs), Shag (32 pairs), Lesser Black-backed Gull (1 pair), Great Black-backed Gull (90 pairs), Herring Gull (246 pairs), Kittiwake (941 pairs), Guillemot (1,468 pairs) and Razorbill (350 pairs) and Puffin (4 pairs). In 2001 an incomplete census recorded Gannet (202 pairs), Cormorant (438 pairs), Kittiwake (1,024 pairs), Guillemot (1,975 pairs) and Razorbill (460 pairs). A Gannet survey by the National Parks and Wildlife Service in 2004 recorded 285 pairs. Black Guillemot may also breed, with 15 individuals recorded in 1998. The Cormorant, Herring Gull, Kittiwake, Guillemot and Razorbill populations are of national importance. The majority of the Cormorant population nest on Thulla and when considered as part of a larger grouping with the colonies on nearby Lambay and St. Patrick's Island, this population is of international importance. The Gannet colony is of particular note as it is one of six in the country and one of only two sites on the east coast. The colony has only been established as recently as the late 1980s and as all breeding ledges became fully occupied in 2006 a satellite colony was then established on the nearby island of Lambay.

Several pairs each of Shelduck, Oystercatcher and Ringed Plover breed. The island is also a traditional site for Peregrine, a species that is listed on Annex I of the E.U.

Birds Directive. In winter small numbers of Greylag Goose and Pale-bellied Brent Goose graze on the island and it is used as a roost site by gulls and some waders.

Ireland's Eye SPA, though a relatively small island, is of high ornithological importance, with five seabird species having populations of national importance. The regular presence of a breeding pair of Peregrine, an Annex I species, is also of note.

SITE SYNOPSIS

SITE NAME: TACUMSHIN LAKE SPA

SITE CODE: 004092

Tacumshin Lake is a shallow coastal lagoon situated on the south Co. Wexford coast. The lagoon was formerly a shallow sea bay which, due to longshore drift, has become separated from the sea by a gravel/sand spit that extends across the mouth of the bay from east to west. At times in the past the lagoon was completely land-locked by the spit and at the end of the 19th century, when this situation prevailed for some time, the lake was drained by means of a large bore pipe set through the gravel/sand bar. In the mid-1970s the spit again closed off the lagoon from the sea. To relieve subsequent flooding of surrounding farmland, the old drainage pipe was reactivated and a second pipe installed at a lower level. The capacity of these two pipes is insufficient to prevent the lagoon filling up in winter when inflow from streams is greater than the outflow through the pipes. To speed the drainage from the lagoon two main drains leading to the landward end of the pipes were excavated.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe, Bewick's Swan, Whooper Swan, Wigeon, Gadwall, Teal, Pintail, Shoveler, Tufted Duck, Coot, Golden Plover, Grey Plover, Lapwing and Black-Tailed Godwit. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The waterfowl population of the lagoon is exceptionally diverse and the area supports large numbers of birds throughout the year, which is unusual among Irish wetlands. In winter, Tacumshin Lake supports internationally important populations of Whooper Swan (213) and Black-tailed Godwit (538) - all figures are mean peaks for the five year period 1995/96 to 1999/2000. A further twelve species occur in numbers of national importance, i.e. Little Grebe (71), Bewick's Swan (235), Wigeon (4,725), Gadwall (119), Teal (975), Pintail (322), Shoveler (107), Tufted Duck (420), Coot (1,669), Golden Plover (3,932), Grey Plover (85) and Lapwing (5,302). Of particular note is that the Pintail and Gadwall populations represent over 19% and 18% of the respective national totals. Other species using the site in winter include Greenland White-fronted Goose (41), Dunlin (374), Curlew (391), Pale-bellied Brent Goose (115), Shelduck (61), Pochard (314), Mallard (196), Redshank (74), Greenshank (6), Black-headed Gull (157) and Lesser Black-backed Gull (146). The site provides both feeding and roosting habitat for the various species.

Hen Harrier roost within the site in winter. Marsh Harrier is a regular visitor in summer and nesting by this very scarce bird of prey is a possibility. Tacumshin is one of the few sites in Ireland where Garganey occurs regularly, and nesting probably occurs in most years. The swamp vegetation supports a good breeding population of

the localised Reed Warbler (*c.* 10 pairs), whilst Sedge Warbler is a common breeding bird.

Tacumshin is an important site for passage waders, including Ruff (12), Little Stint (200) and Curlew Sandpiper (10) – all figures are peak counts in the period 1995/96 to 2004/05. The lagoon is particularly attractive to vagrant North American and Eurasian waterfowl and such species as Pectoral Sandpiper, Spotted Redshank, Green Sandpiper and Wood Sandpiper are regularly recorded in low numbers (1-5) at the site. In autumn the abundant insect life of the dry lake bed provides food for large numbers of migrating Swallows and Martins which also use the reed beds as a night roosting area, with up to 10,000 individuals being recorded in recent years. Large numbers of Lesser Black-backed Gull (up to 1,000) gather at the lagoon for some weeks prior to their autumn migration southwards and some linger into the early winter period.

Tacumshin Lake SPA is one of the most important ornithological sites in the country. The occurrence of internationally important populations of Whooper Swan and Black-tailed Godwit is of especial note, as is the presence of nationally important populations of an additional 12 wintering waterfowl species. It is one of the top sites in the country for Pintail and Gadwall. It is also of importance for its summer visitors, including such rare and localised species as Marsh Harrier, Garganey and Reed Warbler. The site is also notable for a range of passage waders. Also of note is that a number of the species that occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Bewick's Swan, Golden Plover, Ruff, Hen Harrier and Marsh Harrier. Greenland White-fronted Goose which uses the site on occasions is also listed on Annex I of this directive. Part of Tacumshin Lake SPA is a Wildfowl Sanctuary.

SITE SYNOPSIS

SITE NAME: LAMBAY ISLAND SPA

SITE CODE: 004069

Lambay Island lies approximately 4 km off the north Co. Dublin coastline and is separated from it by a channel of 10-13 m in depth. East of Lambay Island the water deepens rapidly into the Irish Sea basin. The island, which rises to 127 m, has an area of 250 ha above high tide mark. The underlying geology is very varied, but is dominated by volcanic igneous rocks (of andesitic type) and ash; also present are shales, limestones and limestone conglomerates. The soils are generally shallow and are derived from glacial tills of Irish Sea origin. The shallow soils are peaty on high exposed ground and above the cliffs. On the western side of the island the land rises gently from a bedrock shoreline. Cobble storm beaches are associated with this shore and at low tide sandflats are exposed within the harbour and below a section of the rocky shore. The northern, eastern and most of the southern shorelines consist of steep cliffs varying from about 15 m to 50 m high. These are backed by vegetated slopes along most of their length. The cliff slopes have a typical maritime vegetation, including such species as Thrift (*Armeria maritima*), Sea Campion (*Silene maritima*), Rock Sea-spurrey (*Spergularia rupicola*) and Spring Squill (*Scilla verna*). Some sheltered gullies have small areas of scrub woodland dominated by Elder (*Sambucus nigra*).

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Fulmar, Cormorant, Shag, Greylag Goose, Lesser Black-backed Gull, Herring Gull, Kittiwake, Guillemot, Razorbill and Puffin. The site is also of special conservation interest for holding and assemblage of over 20,000 breeding seabirds.

Lambay Island is internationally important for its breeding seabirds and is of particular note for the diversity of these, with 12 species breeding regularly. A survey in 1999 recorded internationally important populations of Cormorant (675 pairs), Shag (1,122 pairs) and Guillemot (40,705 pairs). A further six species have breeding populations of national importance, i.e. Fulmar (585 pairs), Lesser Black-backed Gull (309 pairs), Herring Gull (1,806 pairs), Kittiwake (4,091 pairs), Razorbill (2,906 pairs) and Puffin (265 pairs). The island's populations of Cormorant, Shag, Herring Gull and Guillemot are the largest in Ireland. Lambay Island holds the only known colony of Manx Shearwater (25 pairs in 2002) on the east coast of Ireland; in addition, Black Guillemot also breeds here (4 pairs in 1999). In 2007 two new species were added to the island's list of breeding seabirds: Gannet (68 pairs) and Common Gull (1 pair). A survey in 2004 recorded breeding Cormorant (352 pairs), Shag (1,734 pairs), Guillemot (38,999 pairs), Fulmar (727 pairs), Lesser Black-backed Gull (133 pairs), Herring Gull (311 pairs), Great Black-backed Gull (145 pairs), Kittiwake (3,947 pairs), Razorbill (3,805 pairs) and Puffin (209 pairs).

In winter, Lambay Island supports nationally important populations of Greylag Goose (311) and Herring Gull (2,400) – figures are the five year mean peak for the winters 1995/96-1999/2000. Up to the mid 1990s, a Barnacle Goose flock wintered on the island (the only such flock in eastern Ireland) but these have since abandoned the site. Other species which utilise the site during the winter include Light-bellied Brent Goose (55), Oystercatcher (155), Purple Sandpiper (9), Curlew (211) and Turnstone (32). Lambay Island is also the only regular wintering site in Ireland for Whimbrel (5 in 2006).

Lambay Island is a traditional nesting site for Peregrine and also supports the largest colony of breeding Oystercatcher (20-25 pairs) on the east coast. Ringed Plover, Shelduck, Buzzard, Long-eared Owl, Raven and a variety of passerines such as Stonechat, Whitethroat and Reed Bunting also breed.

Lambay Island supports a long-established breeding colony of Grey Seal, a species that is listed on Annex II of the E.U. Habitats Directive. A number of non-native mammals, including Fallow Deer and Red-necked Wallaby, have been introduced onto Lambay Island during the last century. Brown Rat is also present and, notably, the last authenticated record of Black Rat living wild in Ireland was from Lambay Island in 1988. The rat population on the island is believed to be negatively impacting on the burrow nesting species, i.e. Manx Shearwater and Puffin.

Lambay Island SPA holds an internationally important seabird colony and is one of the top seabird sites in Ireland. Three seabird species have breeding populations of international importance and a further six have populations of national importance. In addition to the seabirds, the island also supports nationally important wintering populations of Greylag Goose and Herring Gull. The presence of Peregrine, a species that is listed on Annex I of the E.U. Birds Directive, is also of note.

SITE SYNOPSIS

SITE NAME: SALTEE ISLANDS SPA

SITE CODE: 004002

The Saltee Islands SPA is situated some 4-5 km off the coast of south Co. Wexford and comprises the two islands, Great Saltee and Little Saltee, and the surrounding seas both between them and to a distance of 500 m from them. The bedrock of the islands is of Precambrian gneiss and granite. Both islands have exposed rocky cliffs on their south and east – those on Great Saltee being mostly *c*. 30 m high, those on Little Saltee about half this height. The northern and western sides of both islands are fringed with shingle and boulder shores, backed by boulder clay cliffs, as well as small areas of intertidal sandflats. Sea caves occur at the base of the cliffs on Great Saltee.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Fulmar, Gannet, Cormorant, Shag, Lesser Black-backed Gull, Herring Gull, Kittiwake, Guillemot, Razorbill and Puffin. The site is also of special conservation interest for holding an assemblage of over 20,000 breeding seabirds.

The Saltee Islands are internationally important for holding an assemblage of over 20,000 breeding seabirds. The nationally important Gannet colony on Great Saltee has been well documented since its establishment in the1920s and 2,446 pairs were present in 2004. The following species have populations of national importance (all counts in the 1998-2000 breeding seasons): Fulmar (520 pairs), Cormorant (273 pairs), Shag (268 pairs), Lesser Black-backed Gull (164 pairs), Herring Gull (73 pairs), Kittiwake (2,125 pairs), Guillemot (14,362 pairs), Razorbill (2,505 pairs) and Puffin (1,822 pairs). An estimated 250 pairs of Manx Shearwater occur on these islands. Seabird populations are monitored annually and large numbers of chicks, especially of Gannets, auks and Shags, are ringed.

Peregrine Falcon breeds (1-2 pairs) and Chough (1 pair) occurs at the eastern edge of its Irish range. Hen Harrier uses the site for autumn passage and overwintering.

Great Saltee is a major site for spring and autumn landbird migration and was the site for Ireland's first bird observatory. While the observatory is no longer operational, substantial numbers of migrants are still ringed annually. Large numbers of pipits, swallows and martins, thrushes, warblers and finches occur, while smaller numbers of a great variety of other species (some very rare in Ireland) are also recorded.

The Saltee Islands SPA is of international importance for breeding seabirds; it also supports populations of three species that are listed on Annex I of the E.U. Birds Directive, i.e. Peregrine, Chough and Hen Harrier. It is one of the best-documented sites in the country and is monitored annually.

10.2.2012

SITE SYNOPSIS

SITE NAME: SKERRIES ISLANDS SPA

SITE CODE: 004122

The Skerries Islands are a group of three small uninhabited islands, Shenick's Island, St Patrick's Island and Colt Island, situated between 0.5 km and 1.5 km off the north Co. Dublin coast. Skerries Islands SPA comprises the three islands and the seas surrounding them, to a distance of 200 m from the shore. The three islands are all low-lying with maximum heights ranging from 8 m to 13 m above sea level. St Patrick's Island and Colt Island have low cliffs, while Shenick's Island has more extensive expanses of intertidal rocky shore and sand flats. Shenick's Island also has a shingle bar and is connected to the mainland at low tides; it became a BirdWatch Ireland Reserve in 1987. The vegetation of the islands is dominated by rank grasses, with Brambles (*Rubus* spp.) and other species such as Hogweed (*Heracleum sphondylium*) occurring commonly.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Cormorant, Shag, Light-bellied Brent Goose, Purple Sandpiper, Turnstone and Herring Gull. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The islands are of importance for both breeding seabirds and wintering waterfowl. In 1999 a survey recorded an internationally important population of breeding Cormorant (558 pairs) and a nationally important population of Shag (100 pairs) on St Patrick's Island. The Cormorant population, which was only established in the early 1990s, when taken together with the nearby associated colonies on Lambay Island and Ireland's Eye, comprises about 30% of the total Irish population. A nationally important population of Herring Gull (300 pairs) occurs on St Patrick's Island and Shenick's Island. Other breeding seabirds recorded during the 1999 survey include: Fulmar (35 pairs), Lesser Black-backed Gull (1 pair) and Great Black-backed Gull (95 pairs). Large gulls also breed on Colt Island but there has been no census in recent years. Other breeding birds present include Shelduck, Ringed Plover and Oystercatcher (several pairs of each).

In winter the islands regularly support a range of waterfowl species, including an internationally important population of Light-bellied Brent Goose (242) and nationally important populations of Cormorant (391), Purple Sandpiper (46), Turnstone (242) and Herring Gull (560) – all counts are mean peaks for the five year period 1995/96- 1999/2000. Other species utilising the site during winter include Wigeon (205), Mallard (240), Oystercatcher (463), Ringed Plover (66), Golden Plover (240), Grey Plover (15), Lapwing (238), Dunlin (42), Snipe (27), Curlew (327), Black-headed Gull (110) and Great Black-backed Gull (250). The islands are also a regular wintering site for Short-eared Owl, with several birds recorded in most winters.

The Skerries Islands SPA is of high ornithological importance for both breeding seabirds and wintering waterfowl. Internationally important populations of breeding Cormorant and nationally important populations of two other breeding seabirds occur on the islands. The wintering population of Light-bellied Brent Goose is of international importance and four other species occur in nationally important numbers during the winter. The presence of Golden Plover and Short-eared Owl, two species that are listed on Annex I of the E.U Birds Directive, is of note.

11.9.2009

SITE SYNOPSIS

SITE NAME: BALLYMACODA BAY SPA

SITE CODE: 004023

This coastal site stretches north-east from Ballymacoda to within several kilometres of Youghal, Co. Cork. It comprises the estuary of the Womanagh River, a substantial river which drains a large agricultural catchment. Part of the tidal section of the river is included in the site and on the seaward side the boundary extends to, and includes, Bog Rock, Barrel Rocks and Black Rock. The inner part of the estuary is well sheltered by the Ring peninsula, a stabilised sand spit with sand dunes at its northern end and salt marshes on the landward side. Sediment types vary from muds to muddy sands in the inner part to fine rippled sands in the outer exposed part. The macro-invertebrate fauna of the intertidal flats is well-developed, with the following species occurring: Ragworm (*Hediste diversicolor*), the crustacean *Corophium volutator*, Lugworm (*Arenicola marina*), Baltic Tellin (*Macoma balthica*), Peppery Furrow-shell (*Scrobicularia plana*), Common Cockle (*Cerastoderma edule*) and the tubeworm *Lanice conchilega*. In the more sheltered areas the intertidal flats are colonised by mats of green algae (mostly *Ulva* spp.), with brown seaweeds occurring on the rocky shores of the shingle spits. Common Cord-grass (*Spartina anglica*) has spread within the estuary since the late 1970s. The main channel is flanked by salt marshes and wet fields, much of the latter being improved for agriculture.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Wigeon, Teal, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Sanderling, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Turnstone, Black-headed Gull, Common Gull and Lesser Black-backed Gull. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Ballymacoda Bay is of high ornithological importance for supporting an excellent diversity and large number of wintering waterbirds – it is of international importance because it regularly supports an assemblage of over 20,000 birds. The site provides both feeding and roosting areas for the birds. Furthermore, both Golden Plover (10,920) and Black-tailed Godwit (765) occur here in internationally important numbers (all counts given are mean peaks for the five year period 1995/96-1999/2000). A further eleven species of waders and ducks occur here in nationally important numbers, i.e. Wigeon (907), Teal (887), Ringed Plover (153), Grey Plover (535), Lapwing (4,063), Sanderling (98), Dunlin (3,192), Bar-tailed Godwit (581), Curlew (1,145), Redshank (357) and Turnstone (137). The site is also notable for supporting nationally important populations of some gull species in autumn and winter: Black-headed Gull (1,560), Common Gull (1,120) and Lesser Black-backed Gull (5,051). A total of 107 species were recorded from the site between 1971 and 1988.

Ballymacoda Bay SPA is one of the most important sites in the country for wintering waterfowl. It qualifies for international importance on the basis of regularly exceeding 20,000 wintering birds but also for its Golden Plover and Black-tailed Godwit populations. In addition, it supports nationally important populations of a further fourteen species. Two of the species which occur, Golden Plover and Bar-tailed Godwit, are listed on Annex I of the E.U. Birds Directive. Ballymacoda Bay is also a Ramsar Convention site.

7.7.2014

SITE SYNOPSIS

SITE NAME: BALLYCOTTON BAY SPA

SITE CODE: 004022

Situated on the south coast of Co. Cork, Ballycotton Bay is an east-facing coastal complex, which stretches northwards from Ballycotton to Ballynamona, a distance of *c*. 2 km. The site comprises two sheltered inlets which receive the flows of several small rivers. The southern inlet had formerly been lagoonal (Ballycotton Lake) but breaching of the shingle barrier in recent times has resulted in the area reverting to an estuarine system.

The principal habitat within the site is inter-tidal sand and mudflats. These are mostly well-exposed and the sediments are predominantly firm sands. In the more sheltered conditions of the inlets, sediments contain a higher silt fraction. The inter-tidal flats provide the main feeding habitat for the wintering birds. Sandy beaches are well represented. Salt marshes fringe the flats in the sheltered inlets and these provide high tides roosts. A small area of shallow marine water is also included.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Teal, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Turnstone, Common Gull and Lesser Black-backed Gull. The E.U. Birds Directive pays particular attention to wetlands, and as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Ballycotton Bay supports an excellent diversity of wintering waterbird species. The site supports nationally important populations of the following species: Teal (903), Ringed Plover (167), Golden Plover (2,383), Grey Plover (124), Lapwing (2,782), Black-tailed Godwit (136), Bar-tailed Godwit (175), Curlew (853), Turnstone (179), Common Gull (584) and Lesser Black-backed Gull (1,293) - all figures are five year mean peaks for the period 1995/96 to 1999/2000. Other species which occur include Shelduck (99), Wigeon (522), Mallard (232), Oystercatcher (255), Dunlin (575), Sanderling (56), Redshank (117), Greenshank (12) and Great Black-backed Gull (324). Ballycotton Bay was formerly utilised by Bewick's Swan but the birds have abandoned the site since the reversion of the lagoonal habitat to estuarine conditions.

The site is a well-known location for passage waders, especially in autumn. Species such as Ruff, Little Stint, Curlew Sandpiper, Green Sandpiper and Spotted Redshank occur annually though in variable numbers. Small numbers of Ruff may also be seen in late winter and spring. Rarer waders, such as Wood Sandpiper and Pectoral Sandpiper, have also been recorded.

While relatively small in area, Ballycotton Bay supports an excellent diversity of wintering waterbirds and has nationally important populations of eleven species, of which two, Golden Plover and Bar-tailed Godwit, are listed on Annex I of the E.U.

Birds Directive. Ballycotton Bay is also a Ramsar Convention site and part of the Ballycotton Bay SPA is a Wildfowl Sanctuary.

30.5.2015

SITE SYNOPSIS

SITE NAME: CORK HARBOUR SPA

SITE CODE: 004030

Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Douglas, Owenboy and Owennacurra. The SPA site comprises most of the main intertidal areas of Cork Harbour, including all of the North Channel, the Douglas River Estuary, inner Lough Mahon, Monkstown Creek, Lough Beg, the Owenboy River Estuary, Whitegate Bay, Ringabella Creek and the Rostellan and Poulnabibe inlets.

Owing to the sheltered conditions, the intertidal flats are often muddy in character. These muds support a range of macro-invertebrates, notably *Macoma balthica*, *Scrobicularia plana*, *Hydrobia ulvae*, *Nepthys hombergi, Nereis diversicolor* and *Corophium volutator*. Green algae species occur on the flats, especially *Ulva* spp. Cordgrass (*Spartina* spp.) has colonised the intertidal flats in places, especially where good shelter exists, such as at Rossleague and Belvelly in the North Channel. Salt marshes are scattered through the site and these provide high tide roosts for the birds. Some shallow bay water is included in the site. Rostellan Lake is a small brackish lake that is used by swans throughout the winter. The site also includes some marginal wet grassland areas used by feeding and roosting birds.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Mallard, Pintail, Shoveler, Red-breasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank, Black-headed Gull, Common Gull, Lesser Black-backed Gull and Common Tern. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Cork Harbour is an internationally important wetland site, regularly supporting in excess of 20,000 wintering waterfowl. Of particular note is that the site supports internationally important populations of Black-tailed Godwit (1,896) and Redshank (2,149) - all figures given are five year mean peaks for the period 1995/96 to 1999/2000. Nationally important populations of the following 19 species occur: Little Grebe (57), Great Crested Grebe (253), Cormorant (521), Grey Heron (80), Shelduck (2,009), Wigeon (1,791), Teal (1,065), Mallard (513), Pintail (57), Shoveler (103), Red-breasted Merganser (121), Oystercatcher (1,809), Golden Plover (3,342), Grey Plover (95), Lapwing (7,569), Dunlin (9,621), Bar-tailed Godwit (233), Curlew (2,237) and Greenshank (46). The Shelduck population is the largest in the country (over 10% of national total). Other species using the site include Mute Swan (38), Whooper Swan (5), Pochard (72), Gadwall

(6), Tufted Duck (64), Goldeneye (21), Coot (53), Ringed Plover (73), Knot (26) and Turnstone (113). Cork Harbour is an important site for gulls in winter and autumn, especially Black-headed Gull (3,640), Common Gull (1,562) and Lesser Black-backed Gull (783), all of which occur in numbers of national importance. Little Egret and Mediterranean Gull, two species which have recently colonised Ireland, also occur at this site.

A range of passage waders occurs regularly in autumn, including such species as Ruff (5-10), Spotted Redshank (1-5) and Green Sandpiper (1-5). Numbers vary between years and usually a few of each of these species over-winter.

Cork Harbour has a nationally important breeding colony of Common Tern (102 pairs in 1995). The birds have nested in Cork Harbour since about 1970, and since 1983 on various artificial structures, notably derelict steel barges and the roof of a Martello Tower. The birds are monitored annually and the chicks are ringed.

Cork Harbour is of major ornithological significance, being of international importance both for the total numbers of wintering birds (i.e. > 20,000) and also for its populations of Black-tailed Godwit and Redshank. In addition, it supports nationally important wintering populations of 22 species, as well as a nationally important breeding colony of Common Tern. Several of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Little Egret, Golden Plover, Bar-tailed Godwit, Ruff, Mediterranean Gull and Common Tern. The site provides both feeding and roosting sites for the various bird species that use it. Cork Harbour is also a Ramsar Convention site and part of Cork Harbour SPA is a Wildfowl Sanctuary.

Screening Statement for Appropriate Assessment and Natura Impact Statement

Appendix 4

Appendix 5.1 of EIAR- Construction and Environmental Management Plan

NIS Appendix 4

Appendix 5.1 of EIAR-
Construction and Environmental
Management Plan

IRELAND • UK • UAE • BAHRAIN • KSA

BYRNELOOBY

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Wicklow County Council

Arklow Flood Relief Scheme

Construction Environmental Management Plan

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Disclaimer: Please note that this report is based on specific information, instructions and information from our Client and should not be relied upon by third parties.					

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Contents

Appendices

1 Introduction

1.1 Overview

This Construction Environmental Management Plan (CEMP) has been prepared by ByrneLooby to support Wicklow County Council's application for consent for the proposed Arklow Flood Relief Scheme (hereafter referred to as 'the proposed scheme'). The proposed scheme comprises the following:

- Works at Arklow Bridge, a protected structure (RPS A26), including the underpinning of the piers and southern abutment, removal of existing concrete scour protection slab and lowering the floor of Arklow Bridge by approximately 1m, construction of new concrete scour protection slab and remedial works to bridge masonry;
- River dredging works to improve channel capacity comprising dredging of the river channel from approximately 320m upstream of Arklow Bridge to approximately 520m downstream of Arklow Bridge including removal of in- river sandbanks and vegetated islands north of Arklow Bridge and trimming of vegetation along the north bank between the debris trap and Arklow Bridge; and occasional future maintenance as required of the river channel by dredging, estimated to be at 10-year intervals.
- Extension into the river channel by circa 12m along an approximate 75m length of the northern river bank upstream of Arklow Bridge.
- Construction of debris and gravel traps in the river channel upstream of Arklow Bridge, and a permanent river access ramp for their maintenance on the south bank of the Avoca River adjacent to the junction of River Lane and River Walk. Annual maintenance of the debris trap and gravel trap using a temporary in-river haul road.
- Flood Defences on the south bank of the Avoca River including:
    - Demolition of existing walls and river access and provision of approximately 325m of flood defence concrete finish wall founded on sheet piles and concrete foundations with intermittent glass panels upstream on River Walk from just west of St. Mary's (Main Street) car park to Arklow Bridge;
    - Demolition of some existing walls, provision of approximately 655m of flood defence concrete finish wall founded on sheet piles and concrete foundations with a glass panel at the former Tyrells yard slipway, and modifications to approximately 20m of existing wall downstream of Arklow Bridge, on South Quay and on the western and southern sides of the Dock); *and*
    - At the Dock, in the Harbour area, installation of demountable flood barriers at two locations to allow access to the shipyard and the public slipway, which will normally be maintained in a closed position.
- Flood Defences on the north bank of the Avoca River including approximately 545m flood defence earthen embankment with adjoining maintenance track in Arklow Town Marsh close to its eastern boundary and approximately 60m sheet-

piled wall with concrete cap to be constructed upstream of Arklow Bridge's north western abutment, and realignment and reforming/reinforcing both banks of the existing channel where it enters the Avoca River to the west of the Avoca Bridge. Permanent access road from Dublin Road to maintenance track.

- Removal of existing public realm at River Walk and South Quay including demolition of the river access at the junction of River Lane and River Walk and a disused slipway (referred to as Coal Quay) on South Quay, existing footpaths, lighting, parking spaces and seating. Provision of new public realm at River Walk and South Quay including parking spaces, footpaths, amenity/viewing area, lighting, planters and floating pontoon. Provision of additional urban space extending approximately 6m into the river on South Quay immediately south of the Arklow Bridge for a length of approximately 260m. Provision of additional urban space extending between approximately 0m and 6m into the river on River Walk for a length of approximately 100m.
- Temporary works including establishing six site compounds: northeast edge of Arklow Town Marsh with access from the Dublin Road; on lands between the running track and Mill Road; on land between the River and the roundabout located at the junction of Arklow Bridge, Ferrybank and North Quay; on part of the St Marys (Main Street) car park; on lands between the eastern end of North Quay and North Pier: and on lands between Arklow Golf Club and South Beach. These six site compounds will operate over the duration of the works and will facilitate the construction of the scheme and archaeological examination and temporary stockpiling of excavated and dredged material. River access for construction will take place at North Quay, South Quay, River Walk and north-west of Arklow Bridge.
- The proposed works includes for road reconstruction, road regrading, traffic calming, alterations and additions to the surface water drainage network including three pump stations and non-return valves at the river discharge points on River Walk/South Quay, provision of a section of sewer for others in River Walk/South Quay, diversion of utilities including electricity cables in Arklow Town Marsh, tree felling, tree trimming, tree planting, landscaping, local riverbed raising, installation of floating roosting platforms for birds upstream of Arklow Bridge and all associated and ancillary works.
- Maintenance of all of the above referenced permanent works.

Descriptions of the above proposed works are provided in Chapter 4, *Description of the Proposed Scheme* of the Environmental Impact Assessment Report (EIAR) prepared for the proposed scheme.

1.2 Purpose

The purpose of this CEMP is to provide a framework that outlines how Wicklow County Council (WCC) will supervise and any Contractor appointed by WCC will manage and implement the mitigation measures described in the EIAR and NIS, in order to minimise negative environmental effects during the construction of the proposed scheme. Construction is considered to include all site preparation, enabling works, demolition, materials delivery, materials and waste temporary

storage and removal, construction activities and associated engineering works. The construction strategy is described in Chapter 5, *Construction Strategy* of the EIAR. Following completion of the construction phase, periodic inspection and maintenance works will be undertaken.

This CEMP identifies the minimum requirements with regard to the appropriate mitigation, monitoring, inspection and reporting mechanisms that need to be implemented throughout construction. Compliance with this CEMP does not absolve the Contractor or its sub-Contractors from compliance with all legislation and bylaws relating to their construction activities.

This CEMP has been produced as part of the application for consent to ensure compliance with legislative requirements and the EIAR and NIS that have been prepared for the proposed scheme.

This CEMP summarises the overall environmental management strategy that will be implemented during the construction and maintenance phases of the proposed Arklow Flood Relief Scheme. On completion of the construction phase, there will be periodic inspection and maintenance of the works. This will be the responsibility of WCC. All maintenance work will be undertaken in accordance with the mitigation measures set out in the EIAR and NIS.

1.3 Structure

This CEMP has been structured as follows:

- Section 1 introduces the proposed scheme and outlines the purpose of the CEMP.
- Section 2 describes the proposed scheme including the construction strategy, programme and land-use requirements.
- Section 3 sets out the site management procedures.
- Section 4 sets out the framework and mechanisms through which environmental requirements will be managed.
- Section 5 sets out the procedures for environmental management.
- Section 6 outlines the specific environmental requirements to be employed during construction.
- Appendix A describes in detail the measures to be implemented to mitigate likely significant negative effects, as far as practicable, during the construction of the proposed scheme.
- Appendices B-C describes the outline of plans cited in Section 6.

1.4 Scheme Delivery and Maintenance

WCC intends to deliver the scheme through five work packages as described in Chapter 5 Construction Strategy of the EIAR. As such, the scheme will be constructed through a number of contracts. Reference in this document to "the Contractor" refers to any of the Contractors that may be employed by WCC to construct the scheme.

Each Contractor will be required to prepare a more detailed CEMP for their specific package of works, as required and outlined within this CEMP. The detailed CEMPs will be specific, targeted, and 'stand-alone' plans developed to support the construction methodologies established during the next phase of the proposed development. The detailed CEMPs will be provided to WCC for consultation and approval in advance of any construction works on site.

Following construction, maintenance of the scheme will be required and implemented by WCC on an ongoing basis.

1.5 Approach

This CEMP provides a framework to:

- Describe the programme for environmental management during construction.
- Implement those monitoring and mitigation measures identified in the EIAR and NIS.
- Outline the principles and minimum standards required of the Contractor during the development of the detailed CEMP (and associated Method Statements) and throughout construction.
- Identify the relevant roles and responsibilities for developing, implementing, maintaining and monitoring environmental management; and
- Outline the procedures for communicating and reporting on environmental aspects of the proposed scheme throughout construction.

It is intended that this CEMP will be expanded and updated by the Contractor prior to the commencement of any construction activities on site.

Following appointment, the Contractor will be required to develop more specific Method Statements and submit a more detailed (bespoke, contract-specific) CEMP that is cognisant of the proposed construction activities, equipment and plant usage and environmental monitoring plan for the proposed scheme. This CEMP should not be considered a detailed Construction Method Statement as it will be the responsibility of the Contractor, appointed to undertake the individual works, in association with WCC, to implement appropriate procedures and progress this

documentation prior to commencement of construction. The CEMP is a dynamic document, and the Contractor will ensure that it remains up to date for the duration of the construction period. The CEMP may need to be updated during the construction period to include such matters as monitoring, results, audit reports, legislative changes and the outcomes of third-party consultations. All of the requirements of the CEMP will be delivered in full by the Contractor. Updating of the CEMP by the Contractor will not affect the robustness and adequacy of the information presented here and relied upon in the EIAR and NIS.

This CEMP outlines the range of potential types of construction methods, plant and equipment which may be used by any Contractor appointed in order to enable their impacts to be assessed for the purposes of the Board's environmental impact assessment and appropriate assessment prior to determining whether to grant planning permission.

The Contractor is required to develop a detailed CEMP that:

- Is in accordance with the mitigation measures specified in the EIAR and NIS and this CEMP.
- Is in accordance with any conditions that may be prescribed as part of the consent(s) for the proposed scheme.
- Is in accordance with the performance requirements set out in the tender documentation.
- Is in accordance with any statutory consents granted for the scheme including the statutory consent approvals which may be granted by An Bord Pleanála, Wicklow County Council and other statutory stakeholders.
- Aligns with those construction details described in the EIAR and NIS to ensure there is no material change in terms of significant effects on the environment; and
- Where practicable the Contractor shall seek to identify opportunities for further reducing significant negative environmental effects and to implement best practice in as far as reasonably practicable, i.e. take every reasonable effort to reduce and prevent negative effects, while enhancing benefits.
- Will have regard to the guidance contained in the handbook published by Construction Industry Research and Information Association (CIRIA)1.
- Includes the Contractor's Environmental Management System (EMS) for the proposed scheme, which will be devised according

[1] CIRIA (2015) Environmental Good Practice on Site Guide, 4th Edition

to the criteria of ISO 14001:2004 – Environmental Management Systems.

Further, the Contractor is required to develop the following plans, and any others considered relevant, and incorporate accordingly into the detailed CEMP:

- Plans described in Chapter 21 of the EIAR (Appendix A);
- Invasive Species Management Plan (Appendix B);
- Soil Management Plan (Appendix C);
- Construction and By-Products Waste Management Plan (Appendix D); and,
- Pest Control Plan (Appendix E).

The detailed CEMP is considered a 'live' documents that will be reviewed and revised regularly as construction progresses. The process for update, review, and approval of the CEMP must be documented in the detailed CEMP to ensure that all revisions can be easily understood, applied and updated by WCC and the Contractor throughout construction.

It is expected that amendments to the CEMP may be necessary to reflect inter alia changes in the project scope, contract scheduling, Contractor appointments, environmental management policies, practices or regulations, and developments on the site. These reviews and updates are necessary to ensure that environmental performance is subject to continual improvement and that best practice is implemented throughout construction. All of the requirements of the CEMP will be delivered in full by the Contractor. Updating of the CEMP by the Contractor will not affect the robustness and adequacy of the information presented here and relied upon in the EIAR and NIS.

Contract documents will require the Contractor to submit the updated CEMP to WCC or its appointed representatives within a predetermined period in advance of commencement of works on site and at defined intervals thereafter.

If a Project Extranet is established, an electronic version of the CEMP will be placed on this site to allow members of staff of the Contractor, the Employer's Representative and other bodies to view the CEMP.

1.6 Guidance and Good Practice

The CEMP will be developed using suitable industry best practise guidance. Guidance from statutory bodies will also be considered. General guidance that will be adopted across all Work Packages includes as a minimum:

- CIRIA (2015) Environmental good practice on site guide (fourth edition) (C741);

- CIRIA (2016) Environmental good practice on site pocket book (fourth edition) (C762);
- CIRIA (2015) Coastal and marine environmental site guide (second edition) (C744);
- CIRIA (2002) Brownfield development sites: ground-related risks for buildings (X263);
- CIRIA (2001) Control of water pollution from construction sites. Guidance for consultants and contractors (C532); and,
- ISO (2015) ISO 14001:2015 Environmental Management Systems -- Requirements with guidance for use.
- National Roads Authority; Guidelines for the Creation, Implementation and Maintenance of an Environmental Operating Plan (undated)
- OPW Series of Ecological Assessment on Arterial Drainage Maintenance No 13: Environmental Guidance: Drainage Maintenance and Construction (2019).

2 The Proposed Scheme

2.1 Construction Strategy

A description of the proposed scheme and its construction strategy, including a description of the key elements of the proposed scheme, the location of construction compounds and the construction phasing and duration, are provided in 'Chapter 4, Description of the Proposed Scheme' and 'Chapter 5, Construction Strategy' in the EIAR. This CEMP must be read in conjunction with the information provided in those chapters and the construction details provided in the Natura Impact Statement (NIS).

2.2 Duration and Phasing

It is expected that the scheme will be delivered through five Work Packages (WP) as described in Chapter 5, Construction Strategy of the EIAR. That chapter sets out how the proposed scheme will be constructed in its entirety. Whilst the general requirements detailed in this chapter will be followed, the Contractor, when appointed, will ultimately be responsible for the sequencing and implementation of the Works in a safe and secure manner and in accordance with all statutory requirements and the measures outlined in the EIAR and in the NIS.

It is planned that the work packages will be executed in the sequence shown in Figure 5.1 of Chapter 5, Construction Strategy of the EIAR.

Coordination of all construction activities in all work packages will be critical in order to minimise shared work areas and access routes and as some work packages have to be completed within the stipulated timeframes due to the seasonal constraints.

Construction activities may have to be coordinated with the Arklow Wastewater Treatment Plant (WwTP) Project, depending on the construction programme for that project and the details of any agreement between OPW and Irish Water with respect to the delivery of the two projects. The overall construction programme will be reviewed by WCC on commencement and completion of each work package.

2.3 Land-Use Requirements

Construction of the proposed scheme will require land take to accommodate temporary construction activities in addition to the land take required to accommodate the permanent elements of the proposed development (as described in Chapter 4, Description of the Proposed Scheme of the EIAR).

Land will also be required to accommodate construction compounds. Construction compounds have been, as much as possible, located close to the working areas. It is expected that local offices, welfare facilities and storage of materials will be accommodated in suitable locations within the working areas. The various

construction compounds are described in Section 5.3 in Chapter 5, Construction Strategy of the EIAR.

River access will be needed for WP1 (bridge works), WP2 (channel dredging works), WP3 (gravel and debris traps) and WP4 (flood defence walls and drainage). These will be located at other suitable locations on the north and south bank, as described in Chapter 5, Construction Strategy of the EIAR.

3 Site Management

3.1 Overview

The Contractor (and any sub-contractors) will be required to comply with all of the performance requirements set out in the tender documentation as well as the statutory consent approvals which may be granted by An Bord Pleanála, Wicklow County Council, EPA and other relevant statutory consent authorities.

It is the responsibility of the Contractor to ensure compliance and to avoid and/or reduce significant adverse effects that have been identified, where practicable.

Where the Contractor diverts from the methodologies and working areas outlined herein and/or defined in the granted planning consent and associated conditions that may be granted, it will be the responsibility of the Contractor to obtain the relevant licenses, permits and consents for such changes.

3.2 Hours of Working

3.2.1 Core Working Hours

The timing of construction activities, core working hours and the rate of progress of construction works are a balance between efficiency of construction and minimising nuisance and significant effects. The core construction working hours for the proposed scheme will be:

- 7am – 7pm: Monday to Friday;
- 8am – 2pm: Saturday.

There will be exceptions to the above, as set out in Chapter 5 of the EIAR on account of specific requirements for a number of construction activities.

3.2.2 Start up and shut down

The Contractor may require a period of up to one hour before and one hour after core working hours for start-up and shut down activities in working areas.

Activities permitted may include deliveries and unloading of materials, movement of staff to their place of work, maintenance and general preparation works. The use of plant or machinery likely to cause disturbance will not be permitted outside of the core working hours.

3.2.3 Additional Working Hours

It may be necessary in exceptional circumstances to undertake certain activities outside of the construction core working hours. Any construction outside of the

construction core working hours will be agreed by the Contractor in advance with WCC and scheduling of such works shall have regard to nearby sensitive receptors.

In the case of work required in an emergency or which if not completed would be unsafe or harmful to workers, the public or local environment, WCC will be informed as soon as reasonably practicable of the reasons and likely duration and timing (outside of the core working hours).

3.3 Security

Security will be the responsibility of the Contractor who will provide adequate security to prevent unauthorised entry to or exit from any site compounds and working areas. The following measures may be used to prevent unauthorised access:

- Install suitable security fencing and gates around site compounds and working areas;
- Install CCTV and alarm systems where required;
- CCTV and security systems will be sited and directed so that they do not intrude into occupied residential properties;
- Provide adequate security guards and patrols;
- When there is no site activity, close and lock site gates and set appropriate site security provisions in motion;
- Consult with neighbouring properties and local crime prevention officers including WCC and An Garda Síochána on site security matters as required; and
- Prevent access to restricted areas and neighbouring properties by securing equipment on site such as scaffolding and ladders.

3.4 Hoarding and Fencing

A site boundary in the form of hoarding or fencing will be established around each of the working areas before any significant construction activity commences in that working area. The hoarding/fencing shall be 2.4m high to provide a secure boundary to what can be a dangerous environment for those that have not received the proper training and are unfamiliar with construction operations.

Hoarding also performs an important function in relation to minimising nuisance and effects including:

- Noise emissions (by providing a buffer);
- Visual impact (by screening the working areas, plant and equipment);
- Dust minimisation (by providing a buffer);

Hoarding will be used to protect any adjacent properties or sites including the habitat of *Equisetum Moorei* (Moore's Horsetail), trees, etc.

The measures described in Appendix A will be applied in relation to hoarding and fencing.

The erection of hoarding will be a similar nature to what is carried out on most construction sites. Mounting posts will be erected by using a mini-digger and the posts would-be set in concrete.

The size and nature of the posts and hoarding will depend on the requirements for any acoustic mitigation as well as preferences that the Contractor may have. Where practicable, hoarding and fencing will be retained, re-configured and re-used between working areas as the construction activities progress.

The measures described in Appendix A will be applied in relation to hoarding and fencing.

Additionally, the following measures will be applied in relation to hoarding and fencing:

- Maintenance of adequate fencing and hoardings to an acceptable condition to prevent unwanted access to site compounds and working areas and provide noise attenuation, screening, and site security where required;
- Appropriate sight lines/visibility splays will be maintained around entrances to site compounds and working areas to ensure safety of both vehicles and pedestrians is preserved;
- Use of different types of fencing and hoarding (e.g. mesh fence or solid hoarding including hoardings used for noise control);
- Temporary portable fencing may be used in certain areas, such as for short term occupation of working areas;
- Display information boards with out of hours contact details, telephone helpline number (for comments/complaints) and information on the works;
- Erect notices on site boundaries to warn of hazards on site such as deep excavations, construction access, etc.;
- Ensure suitable measures for tree protection are implemented as required;
- Keep hoarding and fencing free of graffiti or posters;
- Retain existing walls, fences, hedges and earth banks as far as reasonably practicable; and

- Appropriate positioning of the fencing or hoarding to minimise the noise transmitted to nearby receptors or from plant, equipment and vehicles entering or leaving the working area.

3.5 Services and Lighting

3.5.1 Services and Site Lighting

The installation of site services will be undertaken in parallel with the rearrangement of existing utilities, where relevant.

Construction lighting will generally be provided by tower mounted 1000W metal halide floodlights (LED – light emitting diodes), which will be cowled and angled downwards to minimise spillage of light from the site. These will be powered by mains supplies or diesel generators where an electrical supply is not available.

Works to the arches of Arklow Bridge will require task lighting onto the surface of the arches. Similarly, works to the parapet and superstructure of Arklow Bridge will require task lighting directed horizontally onto the work area.

No lighting will be directed at the arches with bat tubes following completion of the work on the bridge.

Floodlights for working areas will make use of multiple lights to produce a more uniform light output and to lower the individual output from a single source. Lighting will generally be used only during periods of construction.

Lighting will be provided on exterior of hoarding at footpaths for public safety where public lighting is inadequate.

A derogation licence for the Arklow FRS has been issued for bats. The Contractor will implement the lighting mitigation measures described in Appendix A to ensure that lighting will comply with the requirements of this licence.

3.6 Welfare Facilities

Welfare facilities will be provided, as appropriate, for construction staff and site personnel such as locker rooms, handwashing facilities, toilets, showers, drying facilities, etc. The location of these will be at the site compounds identified in Chapter 5 Construction Strategy and layouts will be agreed with WCC and identified as part of the detailed CEMPs.

3.7 Reinstatement of Working Areas on Completion

The Contractor will reinstate all working areas and access routes as work proceeds during construction, with the exception for SC1 which will be fully planted (see landscape drawings in Appendix 4.2 for details). All plant, equipment, materials, temporary infrastructure and vehicles will be removed at the earliest opportunity

and the surface of the ground restored as near as practicable to its specified condition.

3.8 Health and Safety

The Contractor will be required to ensure all relevant health and safety, fire safety and security requirements are in place prior to the commencement of construction and in accordance with relevant legislative requirements in addition to the specifications of WCC.

Relevant Irish and EU health and safety legislation will be complied with at all times by all construction staff and personnel during construction. Further, Contractors will have to ensure that all aspects of their works comply with good industry practice and all necessary consents, licences and authorisations that have been put in place for the proposed scheme.

4 Environmental Management Framework

4.1 Overview

The Contractor will be required to comply with relevant documentation including the EIAR, NIS, planning permission and associated conditions received, other statutory consents, this CEMP and any subsequent detailed CEMP.

As part of the environmental management framework the Contractor will need to comply with all relevant environmental legislation and take account of published standards, accepted industry practice, national guidelines and codes of practice appropriate to the proposed scheme. Due regard will be given to the guidance and advice given by ISO14001 Standard and Construction Industry Research and Information Association (CIRIA) guidance (refer to Section 1.6).

The Contractor will be required to develop and implement an Environmental Management System (EMS) that follows the principles of ISO14001. The Contractor's EMS shall include an environmental policy, operational, monitoring and auditing procedures to ensure compliance with all environmental requirements and to monitor compliance with environmental legislation and the environmental management provisions outlined in the relevant documentation.

4.2 Responsibilities

4.2.1 Employer

WCC will be the Employer responsible for ensuring that competent Contractors are appointed to undertake construction and that sufficient resources are made available to facilitate supervision of the Contractor and the appropriate management of risks to the environment. WCC will appoint an Employer's Representative (ER) to assist with these duties and appoint a Contractor to construct the proposed scheme.

4.2.2 Employer's Representative

The ER will be responsible for monitoring compliance with the CEMP. The ER team will include temporary or permanent specialists with appropriate skills and experience as required to monitor site procedures and construction on behalf of WCC, i.e. competent experts in construction, biodiversity, architecture, archaeology and heritage, noise, vibration, dust, waste, land, soils, contamination and/or water.

In order to help fulfil their duties, the ER will carry out an audit of the CEMP at regular intervals to ensure that the Contractor is complying with the environmental provisions of the Contract.

4.2.3 The Contractor

The Contractor appointed will be responsible for the organisation, direction and execution of environmental related activities during the construction of the proposed scheme. The Contractor is required to undertake all activities in accordance with the relevant environmental requirements including the consent documentation and other regulatory and contractual requirements.

The Contractor shall ensure that a CEMP implementation team is formed prior to construction and that the CEMP is updated with clearly defined roles and responsibilities for this team. Appointees to the roles will be sufficiently competent and experienced to undertake the role and responsibilities. The following will be required within the CEMP implementation team as a minimum.

4.2.3.1 Construction Director

The Construction Director will be responsible for the overall execution and organisation of all environmental related activities, as appropriate. Some of the principal duties and responsibilities of this role will include;

- Overall responsibility for the implementation of the CEMP;
- Allocating the correct resources and facilities in order to ensure the successful implementation of the CEMP; and
- Assist in the management review of the CEMP for suitability and effectiveness.

4.2.3.2 Construction Manager

The Construction Manager will be directly responsible to the Construction Director in assisting with the successful execution of the proposed scheme. The principal duties and responsibilities of this role in respect of the CEMP include:

- To report to the Construction Director on the on-going performance and development of the CEMP;
- To discharge their responsibilities as per the CEMP; and
- To manage the Contractor's construction and environmental team to ensure the proper implementation of the CEMP.

4.2.3.3 Site Manager

A Site Manager will be appointed by the Contractor to oversee the day-to-day management of working areas within the site and ensure that effective, safe, planned construction activities are delivered on an ongoing basis to the highest standards. The Site Manager will be a suitably qualified, competent and experienced professional that will oversee site logistics, communicate regularly with

construction staff, accommodate project-specific inductions for staff on site and ensure that all work is compliant with the relevant design standards and health and safety legislation.

4.2.3.4 Environmental Manager

An Environmental Manager will be appointed by the Contractor to ensure that the CEMP is prepared, updated as necessary and effectively implemented. The Environmental Manager will be a suitably qualified, competent and experienced professional that will perform the necessary tasks, review environmental procedures and consult with the members of the construction team and stakeholders as requited. The Environmental Manager will be responsible for:

- Overall responsibility for maintaining and the ongoing development of the CEMP, and all related supporting documents such as environmental control plans and procedures;
- Ensure compliance with the conditions of the planning permission;
- Ensuring the mitigation measures set out in the Environmental Impact Assessment Report (EIAR) and Natura Impact Statement (NIS) are implemented;
- Advise and guide site management on environmental issues;
- Be responsible for the maintenance of all environmental related documentation;
- Conducting regular environmental inspections and audits as specified in the contract and checking adherence to the CEMP;
- Completing a site inspection and compiling an environmental compliance report on a monthly basis;
- Ensuring that construction occurs in accordance with the relevant environmental requirements and that such compliance is adequately recorded and documented;
- Attending site and stakeholder meetings as required;
- Keeping up-to-date with relevant environmental best practice and legislative changes;
- Liaising with the relevant staff to prepare Method Statements and relevant plans for all activities where there is a risk of environmental damage;
- Having a detailed level of knowledge on all aspects of environmental information associated with the proposed scheme;

- Ensuring all personnel have undertaken adequate environmental inductions, awareness briefings and training (including sub-contractors);
- Advising on engagement of external specialists during construction, if required; and,
- Dealing with environmental complaints;
- Managing and responding to environmental incidents and ensuring that all incidents are recorded and reported in an appropriate manner.
- Produce environmental data trends/incident reports as required.

4.2.3.5 Environmental Specialists engaged by the Contractor

To fulfil its obligations under the CEMP and to support its Environmental Manager, the Contractor will be responsible for engaging suitably qualified and experienced professionals including where necessary the following (i.e. depending on the scope of the contract) competent experts:

- Licenced underwater archaeologist;
- Licensed land archaeologist;
- Project ecologist;
- Project aquatic ecologist;
- Structural specialist;
- Noise and vibration specialist;
- Air quality and dust specialist;
- Land, soils and contamination specialist(s);
-

The responsibilities of the experts will include the following, as relevant to their technical area:

- Ensure that all mitigation measures used to protect the environment are in place and are maintained during the works;
- Undertaking and reporting on weekly monitoring and undertaking weekly site inspections;
- Revising the mitigation measures if the monitoring evidence indicates that the measure is not effectively protecting the environment;

- Undertaking an invasive species survey in advance of any soil being disturbed or excavated (ecologist);
- Supervising of any excavation (archaeologist, land, soils and contamination specialist), as required; and
- Provide toolbox talks to all sub-contractors before they start on site.
- Carry out surveys and monitoring as detailed in the CEMP, the EIAR and NIS.

4.3 Communication Procedures

4.3.1 Community and Stakeholder Engagement

The Contractor will take all reasonable steps to engage with stakeholders in the local community, focusing on those who may be affected by the construction works including residents, businesses, community resources and specific vulnerable groups.

Communication with the local community, WCC and other relevant stakeholders, including third-party projects and between Contractors delivering different Work Packages shall be undertaken at an appropriate level and frequency throughout construction.

WCC have an MoU in place with the promoters of the Arklow Wastewater Treatment Plant (WwTP) project (Appendix 2.1 of the EIAR) and communication with stakeholders and the local community will be coordinated with this project, as required.

The Contractor will put in place a Communications Plan which will provide a two-way mechanism for members of the public to communicate with a designated member of the Contractor's staff and for the Contractor to communicate important information on various aspects of the proposed road development to the public. The public communications strategy, which will be finalised by the Contractor, will include:

- Procedures to inform members of the community directly affected by the construction phase on schedules for any activity of a particularly disruptive nature which is likely to impinge on their property such as blasting, demolition, road closures and diversions, pile driving and any mitigating actions that are being taken (shielding, restriction on work hours, etc.) to minimise such disruption.
- Details of a contact name and number for any complaints that may arise during such works. A complaints register will form part of the communications strategy and all complaints will be handled in an efficient manner. The

register will have prescribed methodologies for documenting and actioning complaints received from the community and other relevant stakeholders.

Where communications are related to environmental issues the Contractor's Environmental Manager will be informed and engaged with, as appropriate.

4.3.2 Advance Notice of Works

The Contractor will ensure that local residents, businesses, occupiers, general users of the area and other relevant stakeholders are informed in advance of construction activities that may affect them. Relevant obligations and procedures in relation to advance notice of works will be identified in the detailed CEMP and in the Communications Management Plan.

All notifications will detail the nature, estimated duration and working hours. All notifications will include a project-specific contact number to which any enquires can be directed. The Contractor will be responsible for preparing and issuing the notifications subject to the relevant approval and consents.

WCC and the Contractor in consultation with WCC and statutory stakeholders will decide whether to arrange any further targeted consultation with the public or relevant stakeholders in advance of specific construction activities on a local basis.

4.3.3 Contacts

An emergency contact list will be established and made available to all construction staff employed. The contact list shall be displayed prominently on site as well as at suitable locations where construction activity is being carried out around working areas. The contact list will include key environmental representatives that may need to be contacted in the event of an incident.

4.3.4 Enquiries and Complaints

The Contractor will establish a process for handling all enquires including complaints. All enquires will be recorded and a log will be maintained to include details of the response and action taken. This will be available upon request for inspection to Wicklow Country Council. All enquiries, whether a query or a complaint, will be dealt with in a timely manner.

The Contractor's Environmental Manager will be immediately informed of any environmental- related issues that have been raised. Where appropriate, the Environmental Manager will be responsible for informing WCC, relevant stakeholders and statutory bodies.

5 Environmental Management Procedures

5.1 Training, Awareness and Competence

The Contractor (and their sub-contractors) will be selected with due consideration of relevant qualifications and experience. The Contractor will be required to employ construction staff with appropriate skills, qualifications and experience appropriate to the needs of the works to be carried out during construction.

A site induction will be provided to all construction staff before they commence work on site. Where appropriate, the Contractor will identify specific training needs for the construction workforce and will ensure that appropriate training requirements are fulfilled.

The Contractor must establish an Environmental Training and Awareness Programme and ensure that all personnel receive adequate training prior to the commencement of construction activities. A baseline level of environmental awareness will be established through the site induction programme. Key environmental considerations and objectives will be incorporated into this induction. Specifically, site inductions will cover the following as a minimum:

- Introduction to the Contractor's Environmental Manager;
- Description of the CEMP and consequences of non-compliance;
- The requirements of due diligence and duty of care;
- Overview of conditions of consents, permits and licences;
- Requirements associated with community engagement and stakeholder consultation;
- Identification of environmental constraints and notable features within the site; and
- Procedures associated with incident notification and reporting including procedures for dealing with damage to the environment.

Nobody will work on site without first receiving environmental induction. Signed records of environmental training will be established, maintained and made available to the Employers Representative.

Site briefings and talks will be carried out on a regular basis to ensure that construction staff have an adequate level of knowledge on environmental topics and community relations and can effectively follow environmental control procedures throughout construction.

5.2 Meetings

WCC and/or the ER will arrange regular meetings (at least every three months) during the construction period to discuss environmental matters and ensure effective coordination to be attended by:

- WCC;
- ER;
- Contractor's Environmental Manager; and
- Environmental Specialists – engaged by either Wicklow County Council and/or the Contractor.

The Environmental Manager will be responsible for arranging and holding monthly meetings and site walk overs with the Employer's Representative. The Environmental Manager will develop and distribute minutes of the monthly meetings and distribute them accordingly.

5.3 Monitoring, Inspections and Audits

For the duration of the contract(s), the environmental performance of the Contractor will be monitored through site inspections and audits. The programme for monitoring, inspections and audits shall be specified in the contract and it is likely to be a combination of internal inspections and independent external audits that may be either random or routine.

Records of all inspections carried out shall be recorded on standard forms and all actions shall be closed out in a reasonable time. The detailed CEMP will include further details of inspection procedures.

The Contractor will implement the monitoring measures described in Appendix A.

5.3.1 Monitoring

Mitigation and monitoring will be carried out in accordance with the requirements of the EIAR and NIS so that construction activities are undertaken in a manner that does not give rise to significant negative effects. Suitable monitoring programmes will need to be developed, implemented, documented, and assessed (with potential follow up) in accordance with the detailed CEMP.

The results of all environmental monitoring activities will be reviewed by the Contractor's Environmental Manager on an ongoing basis to enable trends or exceedance of criteria to be identified and corrective actions to be implemented as necessary. The Contractor will be required to inform the Employer's Representative of any continuous exceedances of criteria.

5.3.2 Inspections

Routine inspections of construction activities will be carried out by the Contractor's Environmental Manager on a daily basis to ensure all necessary environmental measures relevant to the construction activities are being effectively implemented by construction staff, ensuring legal and contractual conformity.

More detailed inspections will be undertaken by the Environmental Manager on a weekly basis. The weekly inspections will be appropriately documented by the Environmental Manager and copies of these records and any action required to be undertaken shall be made available to the Employers Representative.

Each month one of the weekly inspections will include a review of environmental documentation and records. The monthly inspection will be recorded on a standard form and reported to the Employers Representative within five days of the inspection taking place. This standard form will address the following as a minimum:

- Summary of compliance/non-compliance with the CEMP;
- Results and interpretation of the monitoring programme;
- Key issues noted in inspections and/or audits;
- Summary record of non-conformities, incidents and corrective actions;
- Summary of environmental complaints and queries received in relation to environmental matters; and
- Summary record of environmental training undertaken by staff.

5.3.3 Audits

WCC will arrange for independent environmental audits to be carried out to advise on compliance with applicable environmental regulatory requirements, the efficacy of the environmental management approaches used, and recommendations for reducing identified environmental risks (if considered appropriate).

Further, regulatory and statutory bodies may undertake site visits to monitor compliance with legislative and regulatory requirements. These site visits may occur randomly throughout the construction period. The Contractor will facilitate these visits and the Contractor's Environmental Manager will be available to provide information as required and deal with any issues that may arise during, or as a result of, these visits.

Planned and documented audits aimed at evaluating the conformance of the EMS will also be carried out by the Environmental Manager. As part of the detailed CEMP, the Environmental Manager will establish a schedule for internal audits and this inspection calendar will be made available to the Employer's Representative. These environmental audits will be scheduled at least once every three months.

The Contractor will be required to prepare standard forms for reporting and audit items shall include but not be limited to the following activities:

- Review of environmental documentation to establish if relevant requirements are being achieved and if continual improvement is occurring;
- Site inspection and interviews with onsite personnel; and
- Reporting with recommendations.

For any environmental nonconformities found, the auditor will prepare a Corrective Actions Report to describe and record the findings of the non- conformance. The verification of previous Corrective Actions Reports shall be also recorded.

Upon completion of an audit, the auditor will review all Corrective Actions Reports and prepares an Audit Report to summarise:

- Corrective action requests raised;
- Previous corrective action requests closed; and
- Observations made during the audit.

The Contractor's Environmental Manager will be entitled to participate in all audits. Notwithstanding this, the Employers Representative shall produce and provide the Contractor with a copy of each audit report within five working days of the audit. Each audit report will detail the findings from the auditor, specify non- conformances identified and outline the proposed corrective action.

5.4 Incident Response

5.4.1 Corrective Actions

5.4.1.1 Overview

Corrective actions are measures to be implemented to rectify any non-conformances (i.e. exceedance of criteria or targets) identified during monitoring, inspections and/or audits.

In the first instance, an investigation shall be undertaken by the Environmental Manager to identify the cause of any non-conformances. Appropriate remedial measures shall be identified and implemented as soon as practicable to prevent further exceedances. If necessary, the appropriate statutory authority and stakeholders will be notified.

Where new or amended measures are proposed, the relevant CEMP will be updated accordingly by the Environmental Manager and the Employer's Representative shall be informed at the earliest opportunity.

5.4.1.2 Corrective Action Reports

As outlined in Section 5.3.3, a Corrective Actions Report is prepared on foot of any non-conformances identified during environmental monitoring, inspections and/or audits on site. The Corrective Actions Report will describe in detail the cause and effect of a non-conformance on site and describe the recommended corrective action that is required to remedy it.

An appropriate timeline for closing out the corrective actions will be identified by the Contractor in their detailed CEMP as well as arrangements for the Contractor's Environmental Manager verifying the Corrective Actions Report and informing appropriate authorities and stakeholders in a timely manner.

5.4.2 Emergency Incidents

5.4.2.1 Overview

Emergency incidents are those occurrences that give rise to significant negative environmental effects including but not limited to the following:

- Any malfunction of any mitigation measure and/or environmental protection system;
- Any emission that does not comply with the requirements of the contract and relevant licences;
- Any circumstance with the potential for environmental pollution; or
- Any emergency that may give rise to environmental effects (e.g. significant spillages or fire outbreak).

5.4.2.2 Spill and Leak Control Measures

Every effort will be made to prevent pollution incidents associated with spills during the construction of the proposed scheme (see Section 6.2).

The risk of oil/fuel spillages and lubricant leaks will exist on the site and any such incidents will require an emergency response procedure. The following steps provide the procedure to be followed in the event of an oil/fuel spill occurring on site:

- Identify and stop the source of the spill/leak and alert people working in the vicinity;
- Notify the Contractor's Environmental Manager immediately giving information on the location, type and extent of the spill/leak so that they can take appropriate action;

- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident;
- Contain the spill/leak using the spill control materials, track mats or other material as required. Do not spread or flush away the spill/leak;
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses and/or sensitive habitats;
- If possible, clean up as much as possible using the spill control materials;
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste Contractor with the appropriate permits so that further contamination is limited;
- The Contractor's Environmental Manager and Site Manger shall be notified and inspect the site as soon as practicable and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring; and
- The Environmental Manager will notify the appropriate stakeholders such as WCC, National Parks and Wildlife Service, Inland Fisheries Ireland, National Monuments Service, Department of the Environment, Climate and Communications and Department of Housing, Local Government and Heritage and/or the EPA. Environmental incidents are not limited to just fuel spillages. Therefore, any environmental incident must be reported, recorded and investigated in accordance with the procedures described in Sections 5.4.1and 5.4.2.

The Contractor will implement and update the procedure above to develop a detailed contingency plan that identifies the actions to be taken in the event of a pollution incident, in accordance with the CIRIA guidance 741 Environmental good practice on site. This plan will include as a minimum

- Containment measures;
- Emergency discharge routes;
- List of appropriate equipment and clean-up materials;
- Maintenance schedule for equipment;
- Details of trained staff, location and provision for 24-hour cover;
- Details of staff responsibilities;

- Notification procedures to inform the EPA or Environmental Department of the Wicklow County Council;
- Audit and review schedule;
- Telephone numbers of NPWS and IFI; and
- List of specialist pollution clean-up companies and their telephone number.

5.4.2.3 Emergency Incident Response Plan

A set of standardised emergency response procedures will govern the management of emergency incidents. The Contractor will be required to detail emergency incident response procedures in the detailed CEMP and to develop an Emergency Incident Response Plan.

The Emergency Incident Response Plan will contain emergency phone numbers and the method of notifying local authorities, statutory authorities and stakeholders. Contact numbers for key personnel will also be included therein. Contractors will be required to adhere to and implement these procedures and ensure that all staff and personnel on site are familiar with the emergency arrangements.

In the case of work required in an emergency, or which if not completed would be unsafe or harmful to workers, the public or local environment, WCC will be informed as soon as reasonably practicable of the reasons and likely duration. Examples may include: where the ground needs stabilising if unexpected ground conditions are encountered, concrete pouring taking longer than anticipated due to delayed deliveries or equipment failure.

In the event of an emergency incident occurring, the Contractor will be required to investigate and provide a report including the following, as a minimum:

- A description of the incident, including location, the type and quantity of contaminant and the likely receptor(s);
- Contributory causes;
- Negative effects;
- Measures implemented to mitigate adverse effects; and
- Any recommendations to reduce the risk of similar incidents occurring.

The Contractor will consult with the relevant statutory authorities, stakeholders and relevant parties such as the Health and Safety Authority, the Fire Authority, the Ambulance Service, the EPA, utilities companies and WCC when preparing and developing response measures. Further, if any sensitive receptor is impacted, the appropriate environmental specialists will be informed and consulted with accordingly.

Any response measures will be incorporated into an updated Emergency Incident Response Plan that shall be disseminated accordingly to construction staff, WCC and the Employer's Representative.

5.4.2.4 Emergency Access

The Contractor will be required to maintain emergency access routes throughout construction and identify site access points for each working area.

This shall be developed in partnership with the emergency services and documented as part of the detailed CEMP and Emergency Incident Response Plan.

Arklow Bridge is a significant accessway through the town and the Traffic Management Plan (see Appendix A) will consider emergency services access across the bridge during the period(s) where the bridge is a working area.

5.4.3 Extreme Weather Events

The Contractor will consider the impacts of extreme weather events and related conditions during construction. The Contractor will use a short to medium range weather forecasting service from Met Eireann or other approved meteorological data and weather forecast provider to inform short to medium term programme management, environmental control and mitigation measures.

The detailed CEMP will consider all measures deemed necessary and appropriate to manage extreme weather events and shall specifically cover training of personnel and prevention and monitoring arrangements for staff. As appropriate, method statements shall also consider extreme weather events where risks have been identified, e.g. construction works adjacent to the Irish Sea or within the Avoca River.

5.4.4 Unexpected Discoveries

The Contractor is obliged to put in place appropriate procedures to be employed in the event of encountering unexpected archaeological or cultural heritage assets or subsurface contamination during intrusive ground works (see Section 6.9).

The Contractor will be required to develop appropriate procedures as part of their detail CEMP and the Contractor's Environmental Manager will ensure that specialists (e.g. archaeologist) are facilitated to ensure management in accordance with industry best practice and effective compliance with the relevant legislation. All unexpected discoveries will be reported to the appropriate authorities and documented in an appropriate manner.

5.5 Reporting

5.5.1 Environmental Compliance Report

The Contractor will be required to submit a monthly report to the Employer's Representative for review and approval. The report shall address the following as a minimum:

- Summary of compliance with the CEMP including identification of any non-conformances;
- Interpretation of the results of ongoing monitoring;
- Detailed description of any issues and/or non-conformances identified during inspections and/or audits;
- Record of incidents and corrective actions (including Corrective Actions Reports as appropriate);
- Synopsis of environmental complaints received / queries raised by stakeholders; and Records of environmental training undertaken (as appropriate).

5.5.2 Incident Investigation Reports

The Contractor will inform the Employer's Representative of all emergency incidents immediately and prepare an initial report within 24 hours setting out the details of the incident and cause(s) if known. The Contractor will be required to complete the Environmental Incident Report and any further documentation requested by the Employer's Representative in relation to the incident within seven days of the incident occurring. The Contractor will respond to all comments made by the ER on any incident.

The Environmental Incident Report will contain details of the incident including the location, known and suspected causes and weather conditions. It will define the scale and effects (short, medium, long term, temporary/permanent) as well as required corrective actions and mitigation/ remediation/compensation measures (as appropriate).

5.6 Environmental Records

The Contractor shall maintain records of all environmental documentation including monitoring, test results, method statements and plans. All records will be kept up to date and be made available for audits, inspections and periodical reporting. The Contractor will maintain the following environmental records (as a minimum) that will be made available for inspection to the Employer's Representative and the relevant authorities, if required:

- Management Plans;

- Records of environmental training;
- Environmental inspection and audit reports;
- Monthly environmental reports;
- All monitoring data;
- Waste and chemical inventories;
- Health and Safety records;
- Records of environmental incidents;
- Register of environmental complaints; and
- Corrective Action Reports;

6 Environmental Management Requirements

This section describes the specific environmental requirements identified as part of the specimen design and EIAR and NIS that will need to be adhered to by the Contractor.

It should be noted that Sections 6.1 – 6.17 provide a summary of minimum requirements that shall be built upon by the Contractor when developing the detailed CEMP. It is intended that the measures set out herein will be discussed in more detail with relevant stakeholders as required in order to support the identification of any additional measures to be taken account of during construction.

6.1 Good Housekeeping

General good housekeeping measures are to be adopted throughout all works packages as follows:

- General maintenance of working areas and cleanliness of welfare facilities and storage areas;
- Provision of site layout map showing key areas such as first aid posts, material storage, spill kits, material and waste storage, welfare facilities etc;
- Maintain all plant, material and equipment required to complete the construction work in good order, clean, and tidy;
- Keep construction compounds, access routes and designated parking areas free and clear of excess dirt, rubbish piles, scrap wood, etc. at all times;
- Details of site managers, contact numbers (including out of hours) and public information signs (including warning signs) will be provided at the boundaries of the working areas;
- Provision of adequate welfare facilities for site personnel;
- Installation of appropriate security, lighting, fencing and hoarding at each working area;
- Effective prevention of oil, grease or other objectionable matter being discharged from any working area;
- Provision of appropriate waste management at each working area and regular collections to be arranged;
- Excavated material generated during construction will be reused on site as far as practicable and surplus materials/soil shall be

recovered or disposed of to a suitably authorised waste facility site;

- Effective prevention of infestation from pests or vermin including arrangements for regular disposal of food and material attractive to pests will be implemented. If infestation occurs the Contractor will take appropriate action to eliminate and prevent further occurrence (see Section **Error! Reference source not found.**);
- Maintenance of wheel washing facilities and other contaminant measures as required in each working area;
- No discharge of site runoff or water discharge without agreement of the relevant authorities;
- Open fires will be prohibited at all times;
- The use of less intrusive noise alarms which meet the safety requirements, such as broadband reversing warnings, or proximity sensors to reduce the requirement for traditional reversing alarms;
- Maintenance of public rights of way, diversions and entry/ exit areas around working areas for pedestrians and cyclists where practicable and to achieve inclusive access;
- All loading and unloading of vehicles will take place off the public highway wherever this is practicable; and
- Material handling and/or stockpiling of materials, where permitted, will be appropriately located 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.
- The eternal surfaces of vehicle and equipment will be regularly cleaned. Should project vehicle/equipment moments track mud on road and walkways this will be removed as quickly as possible.

6.2 Leaks and Spills Measures

The following measures regarding storage, refuelling, and other operations with be implemented throughout all works packages:

- Industry standard good practice (e.g. CIRIA) will be followed with regard to pollution prevention;
- Minimise the quantities of oil and fuel onsite until storage compounds are set up;
- Site your oil storage where there is minimal risk of collision from vehicles or plant;

- Potential pollutants shall will be adequately secured against vandalism and will be provided with proper containment according to the relevant codes of practice;
- Fuel, oil and chemical storage facilities should be located on impermeable surfaces with controlled drainage, away from storm water sewers, grids, channels and watercourses;
- Any chemical, fuel and oil stores will be located on an impervious base within a secured bund with a storage capacity 110% of the stored volume;
- Store all chemicals within a bund or drip tray;
- Fuel storage tanks should be locked when not in use to prevent unauthorised access and to reduce the risk of vandalism;
- Refuelling will be carried out by suitable trained personnel;
- Drip trays will be placed underneath any standing machinery during refuelling to prevent pollution by oil/fuel leaks. Where practicable, refuelling of vehicles and machinery will be carried out on an impermeable surface in designated area(s) well away from any watercourse or drainage (at least 10m);
- Biodegradable oils and fuels will be used where possible;
- Machinery maintenance work, re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles / equipment will take place within the site compounds;
- Vehicles and equipment will be regularly checked for leaks, and for damage/wear that could result in a leak, by a suitably qualified and experienced person;
- A daily visual inspection of vehicles and equipment for fuel or lubricant leaks will be undertaken prior to use. Where leaks are identified or suspected the vehicles or equipment will not be used and will be moved to a suitable location to be fixed or disposed of appropriately. The Contractor will record any items that have been repaired/replaced/rejected;
- Any items of plant machinery found to be defective will be removed from site immediately or positioned in a place of safety until such time that it can be removed;
- Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment;
- Spill-kits and hydrocarbon absorbent packs will be available in working areas and site compounds and all site staff will be fully trained in the use of this equipment;

- All in-situ cement works will be monitored by the Contractor's Environmental Manager to ensure that spill prevention and remediation measures are in place, to minimise the risk and extent of spills and to rapidly deploy clean up equipment;
- Vehicles will be parked on hardstanding areas overnight or when not in use, as applicable;
- Vehicles will minimise tracking over natural, exposed or unfinished surfaces, where practicable; and.
- All in-situ concrete works will be monitored by the Contractor to ensure that spill prevention and remediation measures are in place, to minimise the risk and extent of spills and to rapidly deploy clean up equipment.

6.3 Traffic and Transportation

6.3.1 General

The Contractor is required to comply with and implement the measures in Appendix A in relation to traffic and transportation during construction and operation.

- Traffic management in WP1 (Bridge Underpinning, Bridge Remedial Works and Scour Protection) is described in section 5.5.1.4 of the EIAR.
- Traffic management in WP2 (Channel Dredging) is described in Section 5.5.2.4 of the EIAR.
- Traffic management in WP3 (Debris Trap and Gravel Trap) is described in Section 5.5.3.4 of the EIAR.
- Traffic management in WP4 (flood defence walls and drainage along south bank) is described in Section 5.5.4.3 of the EIAR.
- Traffic management in WP5 (flood defence embankment and wall on north bank along eastern edge of Arklow Marsh is described in Section 5.5.5.4 of the EIAR.
- Earthworks haulage will be along agreed predetermined routes along existing national, regional and local routes. Where practicable, compaction of any soil or subsoil which is to remain in situ along the sites will be avoided.
- Due to the construction timelines associated with the Arklow Flood Relief Scheme and the Arklow Wastewater Treatment Plant there is a potential for cumulative impacts should the peak construction of both projects run concurrently. In addition, should both projects be carried out simultaneously, a co-ordinated traffic management plan will need to be prepared and agreed with Wicklow County Council for both projects.

The Contractor(s) for the proposed scheme will prepare a detailed Construction Traffic Management Plan covering all stages of construction as outlined in Appendix A. Any individual Contractor's traffic management plan will need to reflect any other live traffic management plan prepared by the other Contractors associated with the project. WCC will ensure all Contractor's traffic management plans are consistent with each other.

6.4 Air Quality and Climate

The Contractor is required to implement the measures in Appendix A in relation to air quality and climate during construction and operation.

6.5 Odour

The Contractor is required to implement the measures in Appendix A in relation to odour.

6.6 Noise and Vibration

The Contractor is required to implement the measures in Appendix A in relation to noise and vibration.

6.7 Biodiversity

The Contractor is required to implement the measures in Appendix A in relation to biodiversity.

6.8 Invasive Species Management Plan

The Contractor will be required to update and maintain an invasive species management plan. The measures in Appendix B will be implemented.

Prior to commencement, all works areas, site compounds and access routes will be re-surveyed for non-native plant species to ensure that new infestations have not been established. If found, appropriate mitigation strategies will need to be devised and implemented.

Biosecurity measures will be implemented in areas infested with non- native invasive species to prevent the spread of these plants further within the catchment or beyond.

Monitoring for re-emergence of non-native invasive species will be undertaken by the Contractor's Ecologist or a suitably qualified Ecologist.

6.9 Archaeology, Architectural and Cultural Heritage

The Contractor is required to implement the measures in Appendix A in relation to archaeology, architectural and cultural heritage during construction and operation.

6.10 Landscape and Visual

The Contractor is required to implement the measures in Appendix A in relation to Landscape and Visual during construction and operation.

6.11 Land and Soils

The Contractor is required to implement the measures in Appendix A in relation to geology, soils and groundwater during construction and operation. Contractor. The Contractor will be required to develop and implement a soil management plan to ensure appropriate handling and storage of soils occurs during construction. The plan will be developed from the outline provided in Appendix C.

6.12 Water

The Contractor is required to implement the measures in Appendix A in relation to water during construction and operation.

6.13 Resource and Waste Management

The Contractor is required to implement the measures in Appendix A in relation to resource and waste management during construction and operation.

The Contractor will be required to detail and maintain the Construction and By-Products Waste Management Plan provided in Appendix D and update as required.

6.13.1 General Waste

Domestic waste relating to the Contractor's site offices and welfare facilities will be generated. Wastewater from toilets, canteens, etc., will be managed through connection to public sewers where available, the use of septic tanks where appropriate or through the use of storage tanks for disposal by licenced disposal service providers.

Refuse, recyclables and compost will be managed through the use of the appropriate licensed service providers. The measures in Appendix A will be implemented.

6.13.2 Dredge Materials

The Contractor is required to comply with the dredge material management processes described in Chapter 5, Construction Strategy and Chapter 15, Resource and Waste Management of the EIAR and implement the measures described in Appendix A

6.13.3 Excavated Material and Demolition Waste

Materials will arise from the demolition and refurbishment of structures on the site.

Excavations shall be kept to a minimum, using shoring or trench boxes where appropriate. For more extensive excavations, a temporary works designer shall be appointed to design excavation support measures in accordance with all relevant guidelines and standards.

These excavated soil materials will be stockpiled using an appropriate method to minimise the impacts of weathering. Care will be taken in reworking this material to minimise dust generation, groundwater infiltration and generation of runoff. Any surplus suitable material excavated that is not required elsewhere for the proposed development, shall be used for other projects where possible, subject to appropriate approvals/notifications.

The Contractor is required to comply with the mitigation measures provides in Appendix A.

6.14 Population and Human Health

The Contractor is required to implement the measures in Appendix A in relation to population and human health during construction and operation.

The Contractor will be required to implement the Pest Control Plan (PCP) provided in Appendix E and update as required.

6.15 Material Assets

The Contractor is required to implement the measures in Appendix A in relation to material assets during construction and operation.

6.16 Major Accidents and Natural Disasters

The Contractor is required to implement the measures in Appendix A in relation to major accidents and natural disasters during construction and operation.

6.17 Monitoring Measures

The Contractor is required to implement the measures in Appendix A in relation to monitoring during construction and operation.

Appendix A of CEMP

Chapter 21 of EIAR- Summary of Mitigation, Monitoring and Residual Effects

21 Summary of Mitigation, Monitoring and Residual Effects

21.1 Introduction

This chapter provides a summary of the proposed mitigation and monitoring measures as well as an overview of the residual likely significant effects associated with the proposed scheme (as identified in **Chapters 7 – 20**).

21.2 Summary of Mitigation and Monitoring Measures

A number of safeguards and management measures have been identified in order to mitigate negative environmental effects during construction and operation as described in detail in **Chapters 7** – **20**.

It should be noted that chapter this generally excludes any inherent measures and elements that have been incorporated in the design as these design measures have been documented as part of **Chapter 4,** *Description of the Proposed Scheme*. Further, any environmental management measures during construction that have been identified and are associated with specific construction activities and methodologies are documented in **Chapter 5** *Construction Strategy* and in the *Construction Environmental Management Plan* which is available in **Appendix 5.1.** Therefore, the design approach, design measures and construction methodologies as described in **Chapters 4** and **5** and in **Appendix 5.1** shall be implemented as part of the overall mitigation and monitoring strategy.

Monitoring has been identified to occur after consent is granted in order to provide assurance that aspects of the proposed scheme are functioning as intended (and thus not generating significant effects) as described in detail in **Chapters 7 – 20**. Where appropriate, remedial actions have also been identified.

The mitigation and monitoring measures that have been established to minimise any likely significant negative effects arising from the proposed scheme on the surrounding environment are summarised below in **Sections 21.2.1- 21.2.13**.

21.2.1 Traffic and Transport

Construction

A Construction Traffic Management Plan (CTMP), covering all stages of construction, shall be prepared by the Contractor and included in the Construction Environmental Management Plan. The construction traffic management information detailed below shall be included in the CTMP and have been transposed into the CEMP presented in **Appendix 5.1** of the EIAR.

The appointed contractor(s) for the proposed scheme will develop individual CTMPs, based on the overall CTMP in the CEMP, for its/their contract packages and construction methodologies. These individual CTMPs will also take into account other potential construction works in the area as well including the proposed Arklow Wastewater Treatment Plant construction project. The individual CTMPs will contain detailed plans to ensure pedestrians, cyclists and motorised vehicles can pass through the working areas safely and that measures are in place which ensure traffic operates in as an efficient manner possible.

The individual CTMPs will include a detailed consultation strategy to deal with third-party queries from both residents and retail/commercial operators. This strategy will assign ownership of communications (names, companies etc), methods of communication (e.g. website, twitter accounts etc), manage contact details for communications etc). This strategy will form part of the overall Communications Management Plan which is presented in the CEMP in **Appendix 5.1**. The individual CTMPs will require agreement with both Wicklow County Council and An Garda Síochána. Should a contractor be appointed for the Wastewater Treatment Plant (WwTP), its traffic management plans will need to be coordinated between the parties.

The individual CTMPs will be prepared for all Work Packages specifying the designated access routes, to the various site compounds and works areas as described in **Chapter 7** of the EIAR and shall include measures to ensure safe passage of pedestrians, any required laydown areas, temporary diversion routes including location of signage, etc.

As part of the CTMP , the contractor(s) is required to implement the following measures in relation to traffic management throughout the course of the construction works:

- The site compounds (SC) and river access (RA) points will be located as described in **Chapter 5** *Construction Strategy* of the EIAR;
- The contractor will designate specific access routes to be used to access the working areas (WA), site compounds and river access points as described in **Chapters 5** and **7** of the EIAR;
- Night-time works will be carried out for some elements of the construction works as described in **Chapters 5** and **7** of the EIAR;
- Haul Roads in the river channel will be used for WP2, rather than from street level, as described in **Chapter 5** of the EIAR;
- The contractor will coordinate with the WwTP project with regards construction programme and subsequent traffic movements;
- All trucks entering and exiting the site will be covered with a tarpaulin;
- Adequate parking will be provided to avoid queuing at the site entrances and prevent disruption to neighbouring businesses. Construction vehicles will not be allowed to park on the public road either outside a working area or site compound or on any of the approach roads leading to it;

- All trucks entering a working area or site compound will be restricted to suitable speed limits and will be directed to the relevant waiting areas by the Site Manager;
- Trucks required to wait in a working area or site compound will switch off engines to avoid unnecessary fuel usage and noise;
- All trucks exiting a working area or site compound will be required to pass through a wheel wash. A lance will be provided to clean down the bodies and sides of the truck prior to leaving a working area or site compound;
- Roads outside a working area or site compound will be visually inspected on a daily basis and power swept and washed as and when required;
- All site staff including truck drivers will be required to abide by the normal rules of the road;
- Construction safety signs and signals will be installed at identified locations in accordance with the CTMP to coordinate the direction and flow of traffic at working areas. The contractor will be responsible for the maintenance of all construction safety signs and signals.
- Traffic routes affected by the works will be communicated to Arklow residents by the Contractor in advance of commencement of works as per Communications Management Plan described in the CEMP.
- As part of the individual CTMPs, a Mobility Management Plan (Workplace Travel Plans) will be prepared by each contractor to ensure construction workforce access to the working areas and site compounds by sustainable travel modes is encouraged. The Mobility Management Plan (Workplace Travel Plans) shall follow the guidance set out by the National Transport Authority (https://www.nationaltransport.ie/wp-content/uploads/2013/04/Workplace-Travel-Plans-A-Guide-for-Implementers.pdf)

For each construction stage the individual CTMPs will be continually monitored to ensure the impact on traffic capacity and operations on the surrounding street network are minimised and additional mitigation measures will be introduced as required to assist traffic safety or the flow of traffic. The monitoring regime will include all road users including pedestrians, cyclists, and public transport users, as well as car parking provision.

21.2.1.1 Communications Management Plan

The individual CTMPs will be included in the Communications Management Plan and will be used to deal with third-party queries from both residents and retail/commercial operators. The individual CTMPs will require agreement with both Wicklow County Council and An Garda Síochána. Should a contractor be appointed for the Wastewater Treatment Plant, its traffic management plans will need to be coordinated between the parties.

The contractor(s) will appoint a single point of contact to facilitate the communication of the various traffic management plans.

21.2.1.2 Mobility Management Plan

As part of the individual CTMPs, a Mobility Management Plan will be prepared by each contractor to ensure construction workforce access to the working areas and site compounds by sustainable travel modes is encouraged. The following measures will be included within the Mobility Management Plan:

- Arrangements for the provision of showers/ changing rooms for construction staff;
- Arrangements for the provision of cycle parking for staff; and
- The promotion of car sharing among staff, including van pooling to travel between the different working areas.

21.2.1.3 Individual Traffic Management Plans

The individual CTMPs will be prepared for all Work Packages specifying the designated hauls, as described above, to the various site compounds and works areas, measures to ensure safe passage of pedestrians, any required laydown areas, temporary diversion routes including location of signage, etc.

The individual CTMPs will be prepared in consultation with the contractor for the Wastewater Treatment Plant. Construction traffic associated with the Flood Relief project will have to follow any required diversion route needed to deliver the Wastewater Treatment Plant, with particular consideration of possible restrictions on the following streets:

- Arklow Bridge (night-time closures)
- South Quay (diversion of traffic onto Harbour Road and South Green)
- North Quay (particularly the proposed diversion of traffic via Seaview Avenue)
- Marina (diversion of traffic onto Mill Road)

For any works to Arklow Bridge that require lane closures the following measures are suggested:

- No scheduled lane closures should commence before 21:00 and all lane closures should be lifted by 07:00 in the morning.
- The length of lane closure and the required working area needs to be kept as small as possible to reduce the length of the shuttle system.

Operation

No further mitigation measures have been proposed with respect to effects from the operation of the proposed scheme as the insignificant projected increase in traffic will have no impact on prevailing traffic conditions. The mitigation measures which are intrinsic to the construction approach, as discussed above and which are relevant for the maintenance activities will be implemented.

No monitoring has been proposed with respect to effects arising from the operation of the proposed scheme as the projected increase in traffic will have no impact on prevailing traffic conditions.

21.2.2 Air Quality and Odour

Construction

The following measures will be implemented to reduce dust impacts during the construction phase. All of the measures set out below have been incorporated into the Construction and Environmental Management Plan (CEMP) in **Appendix 5.1** of the EIAR for dust management.

Mitigation for all sites

- A Communications Management Plan that includes community engagement will be developed and implemented before work commences on site.
- The name and contact details of person(s) accountable for air quality and dust issues will be displayed on the site boundary. This may be the environment manager/engineer or the site manager.
- The contact information of the contractor's head or regional office will be displayed on the site boundary.

Site Management

- All dust and air quality incidents and complaints will be recorded, the causes identified, appropriate measures will be taken to reduce emissions in a timely manner, and the measures taken will be recorded.
- Regular liaison meetings will be held with the contractors on other significant construction sites within 500 m of the site boundary (i.e. potentially Arklow WwTP), to ensure plans are co-ordinated and dust and particulate matter emissions are minimised. Off-site transport/ deliveries, which might be using the same strategic road network routes, will be co-ordinated.

Monitoring

- Daily on-site and off-site inspection will be undertaken where receptors (including roads) are nearby to monitor dust. Inspection findings will be recorded, and the log will be available to Wicklow County Council when asked. The frequency of inspections will be increased during site activities with a high potential to produce dust are being carried out.
- Dust deposition monitoring locations will be chosen in consultation with the Wicklow County Council.

Preparing and maintaining the site

- The site layout will be planned so that machinery and dust causing activities are located away from receptors, as far as is possible.
- A c. 2.4m hoarding of density of at least 7kg/m^2 will be provided around construction works and site compounds.

- Runoff of water or mud from site will be prevented.
- Site fencing, barriers and scaffolding will be kept clean using wet methods.
- Materials that have a potential to produce dust will be removed from site as soon as possible, unless being re-used on site. If they are being re-used on-site they will be covered as described below.
- Stockpiles will be covered, seeded or fenced to prevent wind whipping.

Operating vehicle/machinery

- All vehicles will switch off engines when stationary - no vehicles will idle on site.
- Mains electricity or battery powered equipment will be used where practicable and the use of petrol or diesel powered generators will be avoided where practicable.
- A maximum-speed-limit of 25 km/hr on surfaced and 15 km/hr on unsurfaced haul roads and work areas will be imposed and signposted.

Operations

- Only cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems, will be used.
- An adequate water supply will be provided on the site for effective dust/particulate matter suppression/mitigation.
- Enclosed chutes and conveyors and covered skips will be used.
- Drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment will be minimised and fine water sprays will be used on such equipment wherever appropriate.
- Equipment will be readily available on site to clean any dry spillages, and spillages will be cleaned up as soon as reasonably practicable after the event using wet cleaning methods.
- Hessian, mulches or trackifiers will be used where it is not possible to re-vegetate or cover with topsoil, as soon as practicable.
- The cover will be removed in small areas during work and all areas will not be uncovered at once
- Sand and other aggregates will be stored in bunded areas and will not be allowed to dry out, unless this is required for a particular process, in which case appropriate additional control measures will be put in place.
- Water-assisted dust sweeper(s) will be used on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Vehicles entering and leaving sites will be covered to prevent escape of materials during transport.

- On-site haul routes will be inspected for integrity and any necessary repairs to the surface will be undertaken as soon as reasonably practicable.
- A wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable) will be provided.
- An adequate area of hard surfaced road will be provided between the wheel wash facility and the site exit, wherever site size and layout permits.
- Access gates will be located at least 10 m from receptors where possible.

Monthly dust monitoring using dust deposition gauges will be undertaken at the construction site/compound boundaries and nearest sensitive receptors to the works during the construction phase of the proposed development. The TA Luft dust deposition limit values of 350 mg/m^2/day will be applied as a 30-day average.

The following mitigation measures to reduce odour impacts are proposed during the dredging and storage of material.

- Vehicles leaving sites will be covered to prevent escape of materials and odour during transport.
- Onsite odour monitoring will be undertaken as follows:
    - Two odour specialists will be present onsite to monitor odour during the excavation of estuarine material from the river (also referred to as dredge material in some sections of the EIAR) during work packages (WP) 1-3, upstream and downstream, and across the channel profile.
    - The odour assessors will alternate so that not one assessor will be continually onsite so that odour fatigue is avoided.

During WP1 and WP3, the following procedures will be observed:

- Estuarine excavated material that is too odorous for archaeological examination at SC1 will be transported directly offsite, as SC5 and SC6 may not be operational during the initial stages of these work packages.

During WP2 the following procedures will be observed:

- Hazardous and non-hazardous contaminated material that is deemed too odorous (odour rating of 3 or more, see **Table 8.23** in **Chapter 8** of the EIAR) for stockpiling at SC2 will be transported directly offsite.
- Inert material that is too odorous for SC1 will be transported to SC6.
- Material with a slightly elevated chloride concentration that is too odorous for SC1 will be transported to SC5.

The assessment of odour will follow the guidance as set out in the EPA's Odour Emissions Guidance Note AG9, as outlined in Table 8.22 and Table 8.23 in Chapter 8 of the EIAR.

Operation

As discussed in Section 8.5.3 of the EIAR, the impact on nearby receptors is likely to be slight, negative and temporary during debris trap clearing and maintenance dredging. During maintenance work, vehicles leaving sites will be covered to prevent escape of materials and odour during transport.

As no significant adverse effects are predicted to occur during the operation of the proposed development, no monitoring measures are required.

21.2.3 Noise and Vibration

Construction

Management Plans and Method Statements

The information provided in the following sections will form part of the Construction Environmental Management Plan (CEMP), as outlined in **Appendix 5.1** of the EIAR. This included of the Construction Environmental Management Plan, detailed construction methodologies, phasing and equipment and, mitigation measures. The appointed Contractor(s) will revise these sections, as appropriate, prior to the commencement of works.

The CEMP will outline how the appointed Contractor(s) will comply with the noise criteria set out in this section and will deal specifically with construction activities in a strategic manner to remove or reduce significant noise and vibration impacts associated with the construction of the proposed development. The CEMP will detail the provision and installation of localised acoustic screens, the best practice noise measures that the appointed Contractor(s) will be required to adhere to for construction activities and the noise and vibration monitoring programme that the appointed Contractor(s) will be required to undertake during the construction works.

In addition, the appointed Contractor(s) will prepare detailed method statements addressing the likely noise and vibration levels that will be generated as a result of the construction activities once the specific details of the proposed plant items and construction methodologies are known.

Where considered necessary, structural surveys will be undertaken at sensitive receptors in close proximity to the works to establish their condition and tolerance for vibration impacts.

General

The following section describes measures to minimise the potential for noise and vibration disturbance to the surrounding area which will be employed by the contractor to ensure the construction noise and vibration criteria outlined in and are not exceeded.

The Contractor will take specific noise abatement measures and comply with the recommendations of BS 5228-1 and 2:2009+A1:2014. *Code of practice for noise and vibration control on construction and open sites. Noise and vibration* and the *European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001*.

The following specific measures will be implemented during the construction phase:

- A site representative shall be appointed to be responsible for matters relating to noise and vibration;
- Construction of temporary infrastructure (e.g. haul roads) will be with materials that minimise noise and vibration and design of haul roads will minimise reversing;
- Internal haul roads shall be well maintained;
- No unnecessary revving of engines, equipment should be switched off when not required;
- Rubber linings shall be used in chutes and dumpers etc. to reduce noise;
- Drop heights of materials shall be minimised;
- Water pumps and generators will be located away from sensitive receivers and will be enclosed;
- Selection of equipment, construction methods and programming with the objective of reducing noise and vibration where possible. Only equipment, including road vehicles, conforming to relevant national or international standards, directives and recommendations on noise and vibration emissions, will be used;
- Plant and vehicles shall be started sequentially rather than all together;
- Selecting electrically powered plant that is quieter than diesel or petrol-driven plant, if interchangeable;
- Fitting suitable anti-vibration mountings where practicable, to rotating and/or impacting equipment;
- Using noise-control equipment such as jackets, shrouds, hoods, and doors, and ensuring they are closed;
- Locate plant, as far as is reasonably practicable, away from receptors or as close as possible to noise barriers or hoardings where these are located between the source and receptor;
- Regular and effective maintenance by trained personnel shall be carried out to reduce noise and/or vibration from plant and machinery;
- Ensuring that all plant is maintained regularly to comply with relevant national or international standards and operation of plant and equipment that minimises noise emissions;
- Ensuring that plant is shut down when not in use;

- Ensuring that air lines are maintained and checked regularly to prevent leaks;
- Designing all audible warning systems and alarms to minimise noise. Non-audible warning systems can be used in preference, i.e. cab-mounted CCTV or the use of banksmen. If required, ensure that audible warning systems are switched to the minimum setting required by the Health and Safety Authority and where practicable use 'white noise' reversing alarms in place of the usual 'siren' style reversing alert
- A c. 2.4m hoarding of density of at least 7kg/m^2 shall be provided around construction works.
- Handling all materials, particularly steelwork, in a manner that minimises noise. For example, storing materials as far as possible away from sensitive receptors and using resilient mats around steel handling areas;
- During construction, regular inspections will be undertaken to ensure that the noise and vibration minimising methods, plant and mitigation identified in the specimen design stage are adopted on site and are working effectively. If applicable, it is proposed that construction method inspections be integrated into any health and safety or quality surveillance regime;
- Typically, site activities shall be limited to 7am – 7pm, Monday to Friday; and 8am – 2pm, Saturday. As outlined in **Chapter 9** *Noise and Vibration* of the EIAR, night-time works may be required if Option 3 (micro piling from bridge) for WP2 is selected. It is anticipated that there will be other times due to exceptional circumstances that construction works will be necessary outside of the standard hours. This will be agreed in advance with Wicklow County Council and communicated to local residents with an estimation of the timing and duration
- A Communications Management Plan shall be prepared to provide for effective community liaison to help ensure the smooth running of construction activities and to address any issues that may arise.

Night-time Works (WP1)

As outlined in **Chapter 9** *Noise and Vibration* of the EIAR, night-time works (for Bridge Grouting and Option 3 (micro piling from bridge)) are predicted to generate moderate, short term, negative impacts. As these impacts are during night-time more targeted mitigation measures are specified;

- A c. 2.4m hoarding of density of at least 7kg/m^2 shall be provided around construction works both at deck level and river level. This hoarding will be placed as close to the noise sources as possible and moved continuously as the works progress along the bridge.
- Using noise-control equipment such as jackets and shrouds around any pumps and engine, including excavators, at river level.

Effective implementation of these measures will reduce the impact during the quietest periods of night-time works from; moderate, short term, negative impacts to slight, short term, negative impacts.

Effective implementation of these measures will reduce the impact during the quietest periods of night-time works from; moderate, short term, negative impacts to slight, short term, negative impacts.

Drainage Works (WP4)

As outlined in **Section 9.5.1.6**, the impact ratings associated with these works at less than 10m are moderate, negative and temporary. As such, more targeted mitigation measures are specified.

- A c. 2.4m hoarding of density of at least 7kg/m^2 shall be provided around construction works. This hoarding will be placed as close to the noise sources as possible and moved continuously as the works progress along.

Effective implementation of these measures will reduce the from; moderate, short term, negative impacts to slight, short term, negative impacts.

Monitoring

The Main Contractor(s) shall be required to carry out continuous noise and vibration monitoring at the three closest sensitive receptors to the proposed development works during the construction phase. Environmental noise monitoring will be undertaken only by suitably trained and experienced staff.

Vibration monitoring will be undertaken on the piers of the bridge and measured against the TII guidance limits in **Table 9.7** of **Chapter 9** of the EIAR**.** In the unlikely event of vibration limits being exceeded, works will cease, and alternative construction methods will be used.

Noise and vibration levels will be compared to the limit values outlined in **Table 9.4** and **Table 9.7** of **Chapter 9** of the EIAR, respectively.

Operation

No mitigation measures are proposed during the operational or maintenance phase of the proposed development.

No monitoring is proposed during the operational or maintenance phase of the proposed development.

21.2.4 Biodiversity

Construction

The biological receptors identified for the provision of mitigation measures to ensure likely significant effects do not occur during the construction and operational phases of the proposed FRS development are listed in **Table 10.15** in **Chapter 10** *Biodiversity* of the EIAR, alongside the associated Impact Mechanisms and a brief description of potential effects.

It should be noted that the mitigation measures not specifically designed to address potential effect in the specific species groups listed in **Table 10.15** but will be implemented as a matter of course during the Arklow FRS and also to

address potential effects associated with the Arklow WwTP project are also listed in the sections below.

Habitats

The site preparation of the compounds will be as described in Section 5.4.3 of **Chapter 5** *Construction Activities* of the EIAR.

For the duration of the construction period when SC1 is in use and during WP5, Arklow Marsh pNHA and the river area will be protected from runoff by the installation of a temporary low bund constructed of impermeable material. It will be situated along the western boundary and will redirect surface water run off towards siltation traps before discharge.

Dredge material will be managed in an area situated on the south eastern portion of SC1 behind Circle K filling station. A low bund will be installed around the area on top of geotextile membrane and hardcore material. A localised stormwater drainage system will be constructed within the area to convey runoff to a sedimentation collection system. The collection system will be periodically monitored during material testing. Run-off collected will be directed to a siltation trap before discharge. These measures will ensure that the likelihood of impacts is low. SC1 will be planted as described below in the following section on completion of the permanent works and as shown in the landscape design and public realm drawings in **Appendix 4.2** of the EIAR.

The site preparation of SC2 will be as described in Section 5.4.3 of **Chapter 5** *Construction Activities* of the EIAR. In summary, a suitable geotextile membrane will be placed over the existing ground and suitable hardcore material will be placed over the geotextile to form a trafficable surface. A low bund, comprising precast concrete traffic barriers or similar wrapped in an impermeable membrane, will be constructed around the perimeter of the site to retain the temporary surface and the dredged material. The temporary surface will be graded to allow any water from dredged material to flow to a shallow drain around the perimeter by which it will flow to a sump from where it will be pumped to a storage tank for collection by tanker for disposal. SC2 will be returned to its current condition by levelling and reseeding the grass area.

At SC3, suitable geotextile membrane will be placed over areas of soft ground and hardcore material will be placed over the site to form a trafficable surface. Surface water run-off at SC3, which is likely to contain sediment due to the movement of construction traffic through it to the river and to WP5 works, will be prevented from running into the adjacent Avoca River by the construction of a low bund along the river edge and the diversion of any runoff to a sump from where it can be discharged through a sedimentation tank. SC3 will be grassed as per the Drawing No 304 (**Appendix 4.2**).

At SC5 and SC6, a low bund, comprising precast concrete traffic barriers or similar, will be constructed around the perimeter of the site to retain the dredged material.

At SC6, a 5m buffer zone will be created between the working area and the *Equisetum Moorei* habitat through the construction of a low bund (approximately

0.5m high) and 1.5m high fence. The bund will prevent any runoff from the dredged material flowing into the habitat of the *Equisetum Moorei.*

SC5 and SC6 6 will be reinstated to their existing condition on completion of the permanent works.

The northern bank, upstream of Arklow Bridge, will be extended into the river channel for a length of c.75m and up to 12.0m in width. The realigned river bank will be formed using rip rap at the river bed level and inert dredge material and earth will be placed on top to match the levels of the existing river bank. The extended river bank will be landscaped with mixed native woodland trees. This area is referred to as Area No 1 on Dwg 304 (**Appendix 4.2** of the EIAR) and will consist of: *Alnus glutinosa* (Black Alder), *Salix aurita, Salix cinerea oleifolia, Salix caprea, Salix petrandra* (Willow) and *Betula pubescens* (Downy Birch).

The increase in levels of sections of the river bank along River Walk and South Bank will provide some opportunities for riparian habitat creation and refuge areas to mitigate direct and indirect effects of the river dredging works on aquatic mammals and birds (Refer to (refer to Drawing Nos. 1003, 1013 and 1016 in **Appendix 4.1** of the EIAR).

Planting

Tree/landscape planting will be undertaken to address the loss of terrestrial habitat to accommodate the FRS. The landscape design/public realm drawings (**Appendix 4.2**) provide details on the planting types and species proposed in addition to the identification of trees to be retained within the planning boundary. Further details are also provided in **Chapter 11** *Landscape and Visual*. The following details on the drawings are of particular relevance for habitat mitigation:

- **Dwg 300:** River Walk (South Bank) Planting proposed: Semi-mature tree species proposed include: *Acer platanoides* 'Columnare' (Norway Maple), *Betula pendula* (Birch), *Crataegus laevigata* 'Paul's Scarlet' (Hawthorn), *Pinus sylvestris* (Scot's Pine), *Prunus avium* 'Plena' (Double flowered Wild Cherry). Ornamental shrubs and perennials, amenity grass.
- **Dwgs 301, 302** and **303:** South Quay to Arklow Harbour (South Bank) - Planting proposed: Semi-mature tree species proposed include: *Acer platanoides* 'Columnare' (Norway Maple), *Ulmus* "Lobei" (Elm), *Prunus avium* 'Plena' (Double flowered Wild Cherry). Ornamental shrubs and perennials, amenity grass.
- The landscaping at Arklow Marsh (adjacent to the proposed embankment) and the extension to the north river bank upstream of Arklow Bridge will provide some opportunities for habitat creation and mitigation of direct and indirect effects on biodiversity due to the loss of in-river vegetated islands and loss of habitat in the marsh pNHA. Further details are provided below.

- Native Woodland planting (Area No 1) is proposed along the new extended north bank of the river (Refer to **Dwg 304**) and will consist of: *Alnus glutinosa*

(Black Alder), *Salix aurita, Salix cinerea oleifolia, Salix caprea, Salix petrandra* (Willow) and *Betula pubescens* (Downy Birch).

- Irish Native species rich grass and wildflower mixture is proposed along the river side of the new floodwall on north bank (SC3) and along the length of the embankment (Refer to **Dwg 304, 305** and **306**).
- Native Woodland planting (Area No 2) is proposed along the east side of the embankment and in SC1 (Refer to **Dwg 304, 305** and **306**) and will consist of: *Alnus glutinosa* (Black Alder), *Salix spp.*(Willow) and *Betula pubescens* (Downy Birch), *Prunus spinosa* (Blackthorn), *Crataegus monogyna* (Hawthorn) and *Viburnum opulus* (Guelder Rose).
- Upon completion of the works, in-stream (aquatic) vegetation will be allowed to re-colonise naturally, however, this will be monitored and if deemed necessary additional planting of suitable aquatic plant species will be undertaken.
- Upon completion of the works any other grassland areas disturbed during the construction works, will be re-sown with an appropriate species-rich grass and/or native wildflower seed mix option (refer to planting detail above and landscape drawings in **Appendix 4.1**).

Tree Removal

The plans for tree removal for construction of the proposed scheme are shown in the landscape drawings in **Appendix 4.2** of the EIAR. Mitigation measures for bats during tree felling are described below under the Bats section.

Bryophytes

It is considered that the bridge does not support a bryophyte flora of conservation interest. However, it does support moderate to high bryophyte cover in some areas (*e.g.* the top concrete).

Bryophyte cover on the bridge be retained where possible. Where bryophytes do need to be removed from a surface, the surface shall be replaced with similar material and the use of very smooth surfaces will be avoided where possible. Urban and aquatic bryophytes tend to quickly re-colonise surfaces as long as there is some texture to the surface.

Non-native Invasive Species

Invasive alien plant species have been identified and documented within the proposed works areas. Construction (and potentially operational maintenance works) could potentially disturb stands of invasive plants and/or soils contaminated with invasive plant material. In addition to lands within the proposed works areas, there is an identified risk of invasive plant species being spread onto neighbouring lands and onto public roads and other locations. The invasive plant species which have been identified in the proposed works areas include Butterfly-bush (*Buddleia davidii*), and Rhododendron (*Rhododendron ponticum*).

Outside of the planning boundary along the Avoca River, Himalayan balsam (*Impatiens glandulifera*) and Japanese Knotweed (*Fallopia japonica*) have both been previously recorded.

A strategy to manage and prevent the spread of the invasive plants is outlined in the Invasive Alien Plant Species Management Plan of the CEMP in **Appendix 5.1** of the EIAR. The management plan includes specific mitigation measures regarding the eradication and biosecurity procedures to protect the habitats and fauna. The management plan also details the careful application of herbicide to treat these species.

Prior to commencement, all works areas, site compounds and access routes will be re-surveyed for non-native plant species to ensure that new infestations have not been established. If found, appropriate mitigation strategies will need to be devised and implemented. Monitoring for re-emergence of non-native invasive species will be undertaken by the Contractor's Ecologist or a suitably qualified Ecologist.

Use of Herbicide at Arklow Bridge

Specific mitigation measures regarding the careful application of herbicide to remove woody vegetation in the bridge during WP1 are presented the CORA report in **Appendix 11.8** of **Chapter 11** *Archaeological, Architectural and Cultural Heritage* of the EIAR.

Diadromous Fish Species

It shall be a requirement of the Contract that the CEMP will provide the minimum requirements that the Contractor will be required to implement.

The Contractor shall submit a detailed programme of work to the client and to Inland Fisheries Ireland showing the order of procedure and the method by which it is proposed to carry out the authorised works, together with a timetable for completion of such work. These works shall comply with the IFI guidance.

The seasonal restrictions contained in the guidance has been modified in consultation with Inland Fisheries Ireland, in respect of the proposed scheme, to take account of the presence and seasonal passage on migration of Habitats Directive Annex II listed fish species Atlantic Salmon, River Lamprey, and potentially also Sea Lamprey in the Avoca River and Estuary. All instream works including the installation and removal of sheet piling or geotextile wrapped gabions required to provide barriers between works areas /temporary haul roads and aquatic habitats will be carried out during the five months of May to September inclusive.

The following mitigation measures will apply:

- Four weeks' notice shall be given in writing to the Employer's Representative and Inland Fisheries Ireland before the authorised works commence;
- To further reduce any potential effect of the dredging on migrating fish species *e.g.* Lamprey and Salmon, dredging shall not be carried out between October to April.

- A suitably qualified Environmental Clerk of Works shall be appointed to oversee and monitor all measures taken to protect the aquatic environment;
- The Contractor shall pay all statutory fees associated with the works;
- The Contractor shall be responsible for maintaining flows in the river at all times. The Contractor will be permitted to construct temporary haul roads in the river however the flow must be maintained throughout this period to enable free passage of fish. The details of the all temporary works in and immediately adjoining the Avoca River shall be subject to approval by the Employer's Representative and by Inland Fisheries Ireland;
- The Contractor shall take all practicable measures to prevent the deposition of silt or other material in, and the pollution or damage to the Avoca River;
- Any construction equipment and vehicle which in the opinion of the Employer's Representative presents a risk of affecting the Avoca River shall be removed from Site;
- Instream machine works shall be minimised, and any machines working in the watercourse must be protected against leakage or spillage of fuels, oils, greases and hydraulic fuels;
- Instream earthworks must be executed so as to minimise the suspension of solids. Construction works, especially ones involving the pouring of concrete, must be conducted in the dry;
- De-watering of any in-stream or marine sheet piled areas will be via a screened water intake pipe, to avoid injury or mortality to any fish that may be present;
- Search for and safe removal to safe waters of any fish trapped in enclosed works areas in the aquatic environment will be carried out by suitably qualified and licenced personnel, using methodologies to be agreed with Inland Fisheries Ireland (e.g. electrofishing);
- Discharge from the dewatering process will be passed to a suitably sized settlement tank or a propriety silt removal system, before discharge to the Avoca River or the local sewer network. Back-up equipment will be required to be maintained ready for use at all works sites.;
- In order to minimise the volumes of water required to be removed from contained works areas in which in-situ cement works and/or excavation are required, works areas will be covered overnight and other periods when works are not in progress, in order to minimise infiltration of rainfall into works areas;
- To minimise the risk of spills and/or leaks, standard good practice will be followed with regard to pollution prevention as part of the appointed Contractor's detailed CEMP(s);
- All in-situ cement works will be monitored by the appointed contractor's Environmental Manager to ensure that spill prevention and remediation measures are in place, to minimise the risk and extent of spills and to rapidly deploy clean up equipment;

- Machinery maintenance work, re-fuelling of construction equipment and the addition of hydraulic oil or lubricants to vehicles / equipment will take place in designated bunded areas within the temporary construction compounds. All waste oil, empty oil containers and other hazardous wastes will be disposed of in compliance with the requirements of the Waste Management Acts 1996, as amended. All of the construction machinery operating near any watercourse will be systematically checked in order to avoid leaks of oils, hydraulic fluids and fuels; and
- Spill-kits and hydrocarbon absorbent packs will be stored in the cabin of each vehicle and operators will be fully trained in the use of this equipment.

Every effort will be made to prevent pollution incidents associated with spills during the construction of the proposed scheme. The risk of oil/fuel spillages and leaks will exist on the site and any such incidents will require an emergency response procedure. The following steps provide the procedure to be followed in the event of an oil/fuel spill occurring on site:

- Identify and stop the source of the spill/leak and alert people working in the vicinity;
- Notify the Environmental Manager immediately giving information on the location, type and extent of the spill/leak so that they can take appropriate action;
- If applicable, eliminate any sources of ignition in the immediate vicinity of the incident;
- Contain the spill/leak using the spill control materials, track mats or other material as required. Do not spread or flush away the spill/leak;
- If possible, cover or bund off any vulnerable areas where appropriate such as drains, watercourses and/or sensitive habitats;
- If possible, clean up as much as possible using the spill control materials;
- Contain any used spill control material and dispose of used materials appropriately using a fully licensed waste contractor with the appropriate permits so that further contamination is limited;
- The Environmental Manager shall inspect the site as soon as practicable and ensure the necessary measures are in place to contain and clean up the spill and prevent further spillage from occurring; and
- The Environmental Manager will notify the appropriate stakeholders such as WCC, National Parks and Wildlife Service, Department of Communications, Climate Action and Environment and Department of Housing, Planning and Local Government and/or the EPA.

With regard to potential risk of run off from dredge material stock-piled at the site compounds for archaeological investigation, all excavated soil including dredge spoil materials will be stockpiled using an appropriate method to minimise the impacts of weathering. Care will be taken in reworking this material to minimise dust generation, groundwater infiltration and generation of runoff. This included the use of suitable silt traps to capture any excess silt in the run-off.

Any surplus suitable material excavated that is not required elsewhere for the proposed development, shall be used for other projects where possible, subject to appropriate approvals/notifications or removed from site for disposal in a suitable authorised facility.

Resident Bird Species

The proposed planting strategy will mitigate the loss of terrestrial habitat for birds, in particular in the Arklow town marsh pNHA (Refer to Refer to **Dwg 304, 305** and **306** in **Appendix 4.2** of the EIAR).

The proposed river dredging will remove the in-river gravel banks. It is proposed to replace the habitat provided by these sandbanks through the use of three manmade roosting platforms (floating islands) (8m x 5m each). These will be low platforms with timber edges and finished in a layer of gravel and will provide roosting areas for birds at all tides. These will be anchored to the bed of the river, upstream of Arklow Bridge, with concrete anchor blocks and chains.

The proposed installation of these three roosting platforms in the river channel upstream of Arklow Bridge will provide for some mitigation of direct and indirect effects on birds due to the loss of in-river gravel beds due to the river dredging works (Refer to Dwg 304 and 301 in **Appendix 4.2** of the EIAR, refer also to **Dwg 1003** in **Appendix 4.1** of the EIAR). Refer also to Figures 12.5.2 and 12.7.2 photomontages (which show the proposed roosting platforms) of **Appendix 12.1** of the EIAR.

The increase in levels of sections of the river bank along River Walk and South Bank will provide some opportunities for riparian habitat creation and refuge areas to mitigate direct and indirect effects of the river dredging works on aquatic mammals and birds (Refer to Dwg 1003, 1013 and 1016 in **Appendix 4.1** of the EIAR).

In addition, new riparian habitat will be created along the northern bank to mitigate direct and indirect effects of the river dredging works on birds.

All vegetation clearance works and site preparatory works will be conducted outside of the bird nesting season (March to August inclusive). If this is not possible, a breeding bird survey will be undertaken by a suitably qualified ecologist in advance of the works to ensure that there will be no impacts on nesting birds. If nests are found, they will be safeguarded, with an appropriate buffer, until the chicks have successfully fledged.

In addition, nesting boxes for the Red-listed species Grey wagtail and for Pied wagtail will be provided in alternate arches of Arklow Bridge, on ledges above high water level in the existing concrete structure on the upstream side of the bridge, in order to provide nesting habitat for these species that feed extensively along the river channel. The nest boxes designs will be suitable for use beneath bridges. The Contractor will be required to consult with a suitably qualified ecologist in the design and installation of the nest boxes.

Bat Species

A Derogation Licence for the Arklow FRS has been issued. Refer to the specific mitigation measures detailed in **Appendix 10.3** of this EIAR and as detailed below.

As all bat species recorded within the planning boundary of the proposed scheme are protected under Annex IV of the Habitats Directive, the works to be carried out to Arklow Bridge will require a derogation from the National Parks and Wildlife Service of the Department of Culture, Heritage and the Gaeltacht to allow works that will create a risk to bats and will remove existing roosting options. The measures proposed will meet the requirements for protecting the bats availing of Arklow Bridge.

The measures proposed specifically for the two southernmost arches of Arklow Bridge derogation include:

- Examination of the bridge prior to works by the licensed bat specialist for evidence of bats.
- Exclusion of bats if necessary with one-way valves devised by the bat specialist.
- Capture of any bats that are still present prior to works and retention until the risk of injury or re-entry to the bridge has been removed.

To ensure that there is no possibility of direct disruption to a summer roost during repairs, the following is proposed:

- The roost on the southern side of the bridge will be excluded during the autumn / early winter season (2021) before construction commences during summer 2022 under the bridge.
- 3 bat boxes will be temporarily installed on the northern side of the bridge as an interim measure to mitigate for the loss of roost (in the period summer/autumn 2021).
- Once the works on the southern side are complete, bat boxes shall be installed on the southern side.
- If bats are using the interim bat boxes on the northern side, these will need to be excluded before works are carried out on the northern side.
- Provision of 4 x 2FR Schwegler woodcrete bat tubes for each arch of three arches at the northern end and 3 arches at the southern end where works are undertaken (i.e. 24 x 2FR bat tubes). These bat boxes must be attached to the bridge in an unlit area above high-water mark. Refer to Drawing No 1005 of Appendix 4.1 of the EIAR which shows the location of the bat tubes on the bridge,
- Provision of additional bat boxes in the flood walls. It is proposed that 6 Schwegler 1FR bat tubes will be incorporated into the flood walls on the southern section of the project (Refer to Drawing Nos 1036, 1039, 1040 and 1041 of Appendix 4.1 of the EIAR which shows the location of the bat tubes in the walls,).

13 x 1FR bat tubes shall be incorporated in the concrete piers of the proposed debris trap which will be located across the river channel upstream of Arklow Bridge (Refer to Drawing Nos 1021 of Appendix 4.1 of the EIAR which shows the location of the bat tubes in the concrete piers).

- This shall be achieved in two phases: Works to southern half of the bridge in the first year requires that only the three bat tubes are installed in the first year of works. Works to the northern half of the bridge in the third year requires that the bat boxes for the southern section of the bridge are installed for the third year of repair work. Provision of 4 x 2FR Schwegler woodcrete bat tubes for each arch of three arches at the northern end and 3 arches at the southern end where works are undertaken (i.e. 24 x 2FR bat tubes). These bat tubes must be attached to the bridge in an unlit area above high-water mark. All remaining shall be installed once all works liable to disturb or damage them has been completed.

Examination of all mature trees, and bat boxes along River Walk with roost potential prior to removal

All mature trees along River Walk along the South Quay and in the works area for work package 5 in Arklow Marsh shall be examined for bats prior to felling. This may be achieved through a bat detector assessment if undertaken in the active season (prior to November and after March) or alternatively may require supervision at the time of felling. Any mature trees will require survey prior to felling.

Lighting at the site compounds

External lighting will be installed around the contractor's compounds for the safety and security of staff on the site. The lighting will be kept close to the buildings and only operate when there is movement. The lighting will be designed in consultation with the licenced bat expert, using emerging lighting technologies and having regard to best practice.

Mitigation for bats includes the following additional lighting considerations:

- Floodlights will be LED, as these have glass lenses which can be used to direct the light to the working area and reduce light spillage;
- Floodlights for working areas will make use of multiple lights to produce a more uniform light output and to lower the individual output from a single source – these will however still be quite high output;
- The site lighting incorporates the use of street lights to light the roadway around the building. The street lights will be selected to minimize upward lighting spill, hoods, louvres, shields or cowls will be fitted on the lights to reduce light spillage, and will incorporate the use of presence detection;
- Perimeter fence lighting will also incorporate presence detection, and will be off by default until motion is detected;
- Low level (~ 1m high) bollard lighting is being used in selected areas (refer to architect's landscape plans);

- Lights will be of low intensity. It is better to use several low intensity lights than one strong light spilling light across the entire area. The source of light will be Light Emitting Diodes (LEDs) as this is a narrow beam highly directional highly energy efficient light source. They shall allow for a light level of 3 lux at ground level. This low lighting is thus easier to control both the direction but also the actual light level because it is so close to the target area (if using bollard lighting);
- Narrow spectrum lighting shall be used with a low UV component. Glass also helps reduce the UV component emitted by lights.

In the event of security lighting being required, it is recommended that infra-red lighting and infra-red cameras are employed to record anti-social activity to assist in crime solving and prevention. This will not raise the visible light levels that will affect mammals and birds to a much greater extent.

Otter

Whilst otter holts were not identified during the walkover surveys within the planning boundary, otter have been observed using the river in the Arklow area and it is likely that the vegetation at the banks of the Arklow Town pNHA may provide suitable habitat for the species. Although, habitat surveys undertaken at the pNHA also did not report evidence of otter runs or slides in the area. Therefore, prior to commencement of works, a survey to identify the presence of any new Otter resting places/holts within 200m of the works areas will be undertaken. If found and likely to be damaged/disturbed by the works, a derogation licence shall be applied for from NPWS. This licence will include otter resting places and holts identified during the pre-construction survey. Any further mitigation measures required by the derogation licence shall be implemented.

The increase in levels of sections of the river bank along River Walk and South Bank will provide some opportunities for riparian habitat creation and refuge areas to mitigate direct and indirect effects of the river dredging works on aquatic mammals such as otter.

To minimise the potential for otters becoming trapped, all excavations will be left open for the minimum possible time, and not over-night. If excavations have to be left open over-night, they will be fitted with an escape ramp (no more than 45°) to allow accidentally trapped animals to escape.

Materials to cover excavations or create escape ramps will be on site at all times so that all excavation areas can be made safe before leaving site.

All materials stored on site will be stacked securely so as to prevent accidental collapse if investigated by an Otter, or any other large mammals.

Badger

In order to mitigate construction impacts on Badger potentially commuting and foraging in the works area the following mitigation measures will be implemented:

- To minimise the potential for Badgers becoming trapped, all excavations will be left open for the minimum possible time, and not over-night.

If excavations have to be left open over-night, they will be fitted with an escape ramp (no more than 45°) to allow accidentally trapped animals to escape. Materials to cover excavations or create escape ramps will be on site at all times so that all excavation areas can be made safe before leaving site.

- All materials stored on site will be stacked securely so as to prevent accidental collapse if investigated by Badger, or any other large mammals.
- Prior to commencement, all works areas, site compounds and access routes will be re-surveyed to ensure that new Badger setts have not been established. If found, appropriate mitigation strategies will need to be devised and implemented. This can be coupled with the survey for otter activity.

Pollution Prevention Measures

In addition to the measures proposed in **Chapter 14** Water of the EIAR, the following measures will be implemented to ensure that the water quality of the Avoca River is not adversely affected through pollution incidents and silt mobilisation. This mitigation will include:

- Appropriate sediment control measures will be employed.
- Any chemical, fuel and oil stores will be located on an impervious base within a secured bund with a storage capacity 110% of the stored volume.
- Biodegradable oils and fuels will be used where possible.
- Drip trays will be placed underneath any standing machinery to prevent pollution by oil/fuel leaks. Where practicable, refuelling of vehicles and machinery will be carried out on an impermeable surface in one designated area well away from any watercourse or drainage (at least 10m).
- Emergency spill kits will be available on site and staff trained in their use.
- Operators will check their vehicles on a daily basis before starting work to confirm the absence of leakages. Any leakages will be reported immediately.
- Daily checks will be carried out and records kept on a weekly basis and any items that have been repaired/replaced/rejected noted and recorded.
- Any items of plant machinery found to be defective will be removed from site immediately or positioned in a place of safety until such time that it can be removed. All items of plant will be checked prior to use before each shift for signs of wear/damage.
- All washing out of grout pumps will be carried out in designated areas away from the river, such as in the lined compound area. At no point will grout pumps be washed out at the worksite.

The procedure for excavating the hazardous and non-hazardous contaminated dredge material along the south bank upstream of Arklow Bridge will be as described in **Chapter 5** *Construction Activities*. This will include

- the installation of a temporary bund made up of impermeable material, approximately 500mm above high tide level will be constructed around the location.

- Dewatering, following removal of any fish for visibility of the riverbed and to enable the contractor to carry out the excavation process, will be required.
- The excavated contaminated dredge material will be transferred onto watertight trucks for transfer to SC2 for archaeological testing and monitoring or transported directly offsite.
- This material will be disposed offsite to an approved hazardous licenced facility or a non-hazardous licenced landfill as appropriate.

Enhancement Work

As detailed in the relevant sections above, planting is proposed as part of the outlined mitigation measures to replace lost habitat. The landscape design/public realm drawings (**Appendix 4.2** of this EIAR) provide details on the planting types and species proposed in addition to the identification of trees to be retained within the planning boundary.

As part of this mitigation, it is intended that the tree and grassland planting will be embraced by the Council and OPW to fulfil not only the mitigation function for habitat loss for bat and other species, but to uphold our national Policy for 'No Net Loss' as outlined in the National Biodiversity Action Plan 2017 -2021.

Action 1.1.3 of the National Biodiversity Action Plan 2017 -2021 states that 'All Public Authorities and private sector bodies will move towards no net loss of biodiversity through strategies, planning, mitigation measures, appropriate offsetting and/or investment in Blue-Green infrastructure. This will help ensure not only the 'no net loss' principal is upheld but that some enhancement effort is made to reverse the direction of biodiversity loss and carbon deficit overall.

To this effect, the planting plan has been designed with this in mind. One area of obvious biodiversity opportunity is the north bank and marsh area. Specific grass and native tree planting has been proposed in this location. In addition, some of the grassed areas will be planted with a pollinator-friendly rich seed mixes. These areas can be adapted to be populated by a suitably biodiverse plant assemblage using a pollinator-friendly rich seed mix, adapted to the soil type present. The Irish based company Design by Nature can supply and provide advice on various wildflower mixes suitable for a range of pollinators local to the area.

The creation of pollinator friendly grasslands will be considered wherever possible throughout the scheme and wherever areas require re-seeding, a bee-friendly grass /wildflower seed mix will be used.

The landscaping at Arklow Marsh (adjacent to the proposed embankment) and the extension to the north river bank upstream of Arklow Bridge will provide some opportunities for habitat creation and mitigation of direct and indirect effects on biodiversity due to the loss of in-river vegetated islands and loss of habitat in the marsh.

The increase in levels of sections of the river bank along River Walk and South Bank will provide some opportunities for riparian habitat creation and refuge areas to mitigate direct and indirect effects of the river dredging works on aquatic mammals such as otter.

The proposed installation of three roosting platforms in the river channel upstream of Arklow Bridge will provide for some mitigation of direct and indirect effects on birds due to the loss of in-river gravel beds due to the river dredging works.

Bat boxes and bat tubes will be permanently installed in the arches of Arklow Bridge (upstream side), in the flood walls and in the RC columns of the debris trap to mitigate direct and indirect effects on bats due to the construction works at Arklow Bridge.

Monitoring

Prior to any work commencing, both aquatic and terrestrial biological surveys shall be carried out throughout the area including at the six site compounds to establish a pre-construction baseline.

Aquatic surveys shall include sampling the river bed upstream and downstream of the bridge and at the site of the proposed gravel and branch trap to record numbers of species and numbers of individuals of invertebrates and also to document sediment chemistry conditions including granulometry, organic carbon and depth of the REDOX layer.

Terrestrial surveys shall be designed to re-map plant communities and habitats throughout the work area. A survey of Site Compound 6 shall be undertaken in the summer months of 2021 to determine if *E.*x *moorei* is present or not.

All areas of the banks of the Avoca River that will be affected by the proposed plan shall be walked over to ensure that no otter holts or badger setts are present.

A monthly survey of water quality at a number of locations in the Avoca River, the Avoca Estuary and the Arklow Marsh shall be established if possible, a year in advance of construction to establish levels of suspended solids, dissolved oxygen and salinity. Additionally, direct recording current meters and tide gauges shall be deployed upstream and downstream of the Arklow Bridge to record flow directions and velocities and pressure.

Monitoring for re-emergence of non-native invasive species will be undertaken by the Contractor's Ecologist or a suitably qualified Ecologist. Any new sighting will be reported the Employer's Representative during the construction phase and Wicklow County Council post construction and recommendations for treatment and eradication proposed.

Acceptance of boxes/tubes by bats can be less predictable than those for birds. Therefore, it is essential to monitor their use over a period of time. Those boxes/tubes that remain unused within two years of date of erection will be re-located. Bat boxes will also be checked in wintertime for general wear and tear and to remove droppings from the previous summer use.

Bat boxes will be inspected, by bat licence holder (bat specialist), at least once within 12 months of erection at appropriate season in order to monitor bat use and the species using boxes. This will be followed up with another inspection within 24 months of setting up. At this point, any bat boxes not used will be relocated to a new site. Any bats found will be counted and identified to species level. All data collected will be submitted to Bat Conservation Ireland.

Additionally, the bat box scheme will be registered with Bat Conservation Ireland and monitoring to be undertaken annually for 2 years.

Maintenance

The scope and nature of maintenance works for the proposed scheme is detailed in Chapter 4, however at this time the exact locations and frequency of maintenance activities are unknown.

Maintenance works (such as the gravel and debris traps and occasional channel dredging) which require in-stream works will follow the same mitigation measures for the protection of biodiversity and water quality set out above for construction stage.

Tree removal shall be limited to the removal of fallen trees or overhanging branches, unless identified as dead of diseased trees that are a risk of blockage. Tree roots shall not be removed from the river-bank.

If a derogation licence is required for maintenance works, e.g. otter and bats, this shall be acquired prior to the decision to progress with the maintenance activities. Any further mitigation measures required by the derogation licence shall also be implemented during the channel maintenance activities.

21.2.5 Archaeology, Architecture and Cultural Heritage

Construction

Project Archaeologist

Due to the complex nature of the work packages proposed for this scheme, a Project Archaeologist shall be appointed to provide a consistent, independent approach to the portfolio of individual work packages and to manage a centralised framework for the development of all archaeological, architectural and cultural heritage considerations.

Subject to obtaining planning approval it is expected that the scheme will be delivered through the following five Work Packages (WP) over a number of years (Refer to **Chapter 5** *Construction Strategy* for details):

- WP 1: Lowering the floor of Arklow Bridge including Bridge underpinning, Bridge remedial works and scour protection works.
- WP 2: Channel dredging upstream and downstream of Arklow Bridge.
- WP 3: Construction of debris and gravel traps with associated maintenance access ramp.
- WP 4: Construction of flood defence walls along River Walk, South Quay and around the dock on the south (right) bank, upstream and downstream of Arklow Bridge including the adjacent stormwater drainage.
- WP 5: Construction of flood defence earth embankment and wall on north (left) bank along eastern side of Arklow Town marsh.

In addition to making consistent recommendations and approving mitigation strategies and ensuring open lines of communication, the Project Archaeologist can provide archaeological training to operators and provide an advisory role, offering practical advice on specific archaeological issues encountered in the field while promoting awareness of cultural heritage assets.

Given that works will be taking place on a number of different fronts, Project Archaeologist will be employed to develop a framework for the archaeological works (including advance archaeological contracts) while securing an approach that will allow the development and construction to proceed in an effective and efficient manner.

The Project Archaeologist will be engaged prior to the construction phase of the project to organise and devise the advance archaeological contracts and oversee the implementation of these contracts and the appointment of the contracting archaeologists.

The appointment of a Project Archaeologist will ensure the smooth running of this scheme while providing a control on budgets. In addition to this the list of services and expertise, a Project Archaeologist can bring to the FRS includes:

- Design of tender specifications and archaeological contracts.
- Programme the sequencing of archaeological investigations in line with the proposed work packages.
- Oversee the conduct of the archaeological excavations.
- Review the archaeological and conservation requirements as the works proceed. Implement any required changes to approved methodologies as works and investigations proceed.
- Certify all archaeological costs.
- Oversee all post excavation works and certify all post excavation costs.
- Review the content of reports prepared by the Archaeological Contractor and ensure that the archaeological contractor provides all appropriate reports on their work in accordance with the contract conditions.
- Provide ongoing consultation with the heritage authorities.
- Ensure all work is proceeding according to archaeological licensing or consent requirements.
- Identify the requirement for additional testing or excavation works.
- Where possible implement time and cost-effective strategies that are in line with best practice guidelines and statutory authority approvals.
- Provide advice to Wicklow County Council and the OPW.
- Provide advice to the design and construction team including the contractor.

Archaeological Management Measures

The programme and schedule for the site preparation/ construction phase and each of the Work Packages (WP1-WP5) will be made available to the Project Archaeologist and the contracted archaeologists, with up to date information on where and when the various elements and ground disturbances and dredging will take place.

It is essential for the client and all contractors to provide sufficient notice to the Project Archaeologist and contracting archaeologist/s in advance of the site preparation/ construction works commencing. This will allow for prompt arrival on site to undertake additional surveys and to monitor ground disturbances. As often happens, intervals may occur during the construction phase. In this case, it is also necessary to inform the archaeologist/s as to when ground disturbance works will recommence.

In the event of archaeological features or material being uncovered during the construction phase, it is crucial that any machine work cease in the immediate area to allow the archaeologist/s to inspect any such material.

Once the presence of archaeologically significant material is established this will be reported to the statutory authorities by the Project Archaeologist. If it is not possible for the construction works to avoid the material, full excavation will be recommended. The extent and duration of excavation will be advised by the Project Archaeologist and is a matter for discussion between the client and the licensing authorities.

It is recommended that the core of a suitable archaeological team be on standby to deal with any such rescue excavation. This will be complimented in the event of a full excavation. The team will include provision for an archaeological dive team, in the event that discoveries are made underwater during dredging.

Site offices and facilities will be provided on or near those sites where excavation is required.

Secure wet and dry storage for artefacts recovered during the course of the monitoring and related work will be provided on or near those sites where excavation is required.

Adequate funds to cover excavation, post-excavation analysis, and any testing or conservation work required will be made available.

Machinery traffic during construction must be restricted as to avoid any of the selected sites and their environs.

Spoil management will take place and no spoil will be dumped on any of the selected sites or their environs.

Mitigation Prior to Construction – Advance Contracts

Subject to obtaining planning approval and due to programme and seasonal constraints, a series of advance archaeological works will be conducted throughout the scheme. Such work will be licensed by the Department of Housing, Local Government and Heritage.

These advance surveys, investigations and excavations will take place at the following area of the scheme and will take the form of:

Embankment at Ferrybank, relocation of utilities

Prior to any work taking place at Ferrybank and Marsh townlands, the electricity overhead lines and any underground buried cables within the proposed works area will have to be diverted. All work will be archaeologically monitored and undertaken in accordance to the EirGrid Guidelines (2015).

The removal of these constraints will allow further archaeological test excavation to take place within an agreed wayleave.

Arklow Bridge

As Arklow Bridge is a protected structure and it falls within the zone of archaeological potential for the historic town of Arklow, works taking place to this structure will be carried out with the advice of a conservation engineer in order to preserve the functionality, character and special interest of the structure and ensure its stability through compatible and durable interventions.

Further site investigation works will be undertaken as a standalone contract at Arklow Bridge. These will be procured during the detailed design stage of the project and will progress on a phased basis over the first year of the programme. This work will include a detailed assessment of the existing masonry bridge structure to fully define the extent of specialist masonry repair works required. This assessment will confirm the presence of previous grouting regimes and will allow an appropriate grouting regime to be established where grouting is required to the piers. Further site investigations will assist in fully understanding the existing foundation detail including the presence and condition of starling piles and the ground conditions under the piers. Site investigation works will be in the attendance of an underwater archaeologist who will systematically record all historic detail and fabric that may be revealed as a result of the works. This work will be carried in accordance with best practice procedure under a detailed methodology agreed with the heritage authorities.

The former historic stone apron consisting of large interlocking stones identified in Appendix 11.8, CORA 2021 and Appendix 11.6 and 11.7 ADCO, Brady 2021(Plate 58) will be fully recorded by a geodetic survey, photographic record and written description. The stone apron that exists between the bridge arches lies underneath a concrete skim in places (this will be lifted where possible to aid recording) and comprises substantial stones bedded in a mortar mix. Investigation to date has concluded that the inclusion of plastic and modern material indicates that the apron is not original to the construction of the bridge and not of a significant age. The stone apron is still part of the historic makeup of the structure and as such it will be fully recorded.

As a conservation measure after recording has taken place, the stones that form the stone apron under Arch No. 1 will be labelled, removed (where possible recovered intact and largely undamaged), stored securely, and reinstated to their original form after the works have been carried out (section 11.5.4.5 of Chapter 11 of the EIAR). No work will take place at Arch. No. 19 where the scour apron will be retained insitu.

All temporary access work in the river, required to facilitate the test investigation work at the bridge will be carried out in agreement with the heritage authorities. Any disturbance of riverbed materials will be monitored by a licensed archaeologist. Design proposals associated with stabilizing the bridge ahead of excavation of the river gravels will be reviewed by an archaeologist and a conservation engineer to ensure that the proposals are in line with best practice from a conservation perspective.

Underwater Archaeology

An experienced and competent licence-eligible maritime archaeologist will be appointed directly by the client to advise the project team on archaeological and cultural heritage matters during construction; to acquire any consents required to conduct the work, and to supervise and direct the archaeological measures associated with the scheme, including to undertake the advance works archaeological mitigations, and to undertake the construction phase archaeological monitoring.

The consents required include an archaeological Excavation Licence. Licence applications are made by the licence-eligible archaeologist on behalf of the client to the National Monuments Service at the Department of Housing, Local Government and Heritage. In addition to a detailed method statement, the applications must include a letter from the client on client letterhead that confirms the availability of adequate funding. There is a prescribed format for the letter that must be followed. Other consents include a Dive Survey licence to conduct archaeological dive work, and a Detection Device licence to use a metal-detector.

All management issues associated with carrying out an underwater archaeological survey assessment are detailed in **Appendix 11.6, Section 5.3**, ADCO 2020).

It is proposed that investigation of the timbers F11–F17 (**Appendix 11.6**, ADCO 2020, **Figure 9**) and associated riverbed will take place as an advance works underwater archaeological contract, to safeguard against the discovery of a composite archaeological feature/s immediately upstream of Arklow Bridge in a location that will be impacted directly by the proposed new upstream bridge apron. Such work will be an underwater archaeological investigation where a team of archaeological divers employing Surface Supplied Diving Equipment will excavate a trench/es across the riverbed at the location of the known timbers to assess the presence of archaeological material in the riverbed. Should the investigation observe that the timbers are associated with a larger feature/s, that feature/s will need to be archaeologically resolved in advance of construction works. Sufficient lead time will be allowed for in the project schedule to permit the investigation and resolution of features in this location.

It is proposed that investigation of the boat wreck feature F19 (**Appendix 11.6**, ADCO 2020, **Figure 9**) and associated riverbed will take place as an advance works underwater archaeological contract, to safeguard against the discovery of a larger boat wreck feature at this location downstream of Arklow Bridge and close to the former Tyrell's boatyard slipway. Such work will be an underwater archaeological investigation where a team of archaeological divers employing Surface Supplied Diving Equipment will excavate around the piece of boat wreck to expose it more fully and to ascertain whether there are related elements buried or close by. The investigation should result in the proper recording of the vessel remains on the riverbed, and its removal from the riverbed for storage in secure waterlogged conditions that meet the requirements of the National Museum of Ireland. Such will permit the fuller study of the vessel remains and will inform decisions as to its permanent storage context.

An archaeological examination of the quay side will take place in advance of the River Access works (RA1-8) to establish the presence of original quay material. This will take the form of a visual inspection, stripping any existing render and recording all historic material (photographic and written description). All locations of historic fabric will be mapped and surveyed.

Debris and Gravel Trap Investigation

It is proposed that investigation of the riverbed at the gravel trap will take place as an advance works underwater archaeological contract, to safeguard against the discovery of archaeological material at the location of the former harbour of Arklow town (**Appendix 11.6**, ADCO 2020, **Figure 8**). Such work will be an underwater archaeological investigation where a team of archaeological divers employing Surface Supplied Diving Equipment will excavate a trench across the riverbed at the location of the silt trap to assess the presence of archaeological material in the riverbed. Construction of the gravel trap will involve the excavation of a trench 12m wide by up to 1.0m deep in the river bed for the full width of the river channel upstream of the debris trap

In tandem with the underwater archaeological investigation, the working area shown in **Figure 4.17** of **Chapter 4,** *Description of the Proposed Scheme* (Drawing Nos. 1003, 1021-1023) will be subject to archaeological investigation as part of the advance archaeological contract.

South Quay Wall and Mooring Posts

In order for remedial and repair work to take place at the existing quay wall that will be exposed at the 'pinch point'– a conservation engineer will be required to advise on the design and conservation specifications at the detailed design stage of the project.

At the 'pinch point' and to the north of it- where the quay wall is already exposed (approx. 74m, South Green – The Green, South Quay), this section of wall will be subject to advance contract works in the form of a rectified photographic record and detailed recording.

Where the sheet pile wall transitions from going in-front of the old quay wall to behind the old quay wall (i.e. where it becomes exposed)- a small section of the old quay wall will be removed either site- at these transition locations. The contractor will seek to reuse this stone in repairing the old quay wall in other locations/capping. The transition section/face of the old quay wall will therefore become exposed on either side. Detailed recording by photographic record will occur in the advance works contract and full archaeological recording will take place during the dismantling of these sections of the wall.

Where reconstruction works are required to tie into the existing wall at these transition areas, salvaged stone can be reused as required.

Similarly, where there are any other interventions with the old quay wall throughout the scheme, these interventions will also be monitored and recorded by the Project Archaeologist as part of the construction programme.

The Mooring posts will be removed locally by archaeological excavation and will be accommodated within a 2m area between the old quay wall and the new quay wall, thereby retaining their authenticity along the quay side **(Drawing No. 6545-302** *Landscape Design and Public Realm* **Appendix 4.2**). Once removed these stones will be labelled, stored at a secure location until reinstatement can take place.

Compounds

Advance archaeological test excavation has taken place (Appendix 11.9) Red Arc Ltd 2021) at SC1, SC3, SC6. There are no anticipated excavation works at compounds SC2, SC4 and SC5 and therefore no archaeological mitigation works are required.

In Marsh townland, the extant remains of Ferrybank House that were revealed through test excavation (**Appendix 11.9**) will be excavated as an archaeological exercise in advance of works taking place for SC3.

The extant remains of a linear stone-faced water channel and stone arch at SC3 that were previously identified by archaeological testing (Appendix 11.9)will be excavated, surveyed and recorded as an advance contract .

At SC6 no further archaeological work is anticipated at the site preparation as no archaeological features were revealed as a result of archaeological testing.

Mitigation During Construction Phases Work Packages 1-5

Compounds

Advance archaeological test excavation has taken place (Red Arc Ltd 2021) at SC1, SC3, SC6. There are no anticipated excavation works at compounds SC2, SC4 and SC5 and therefore no archaeological mitigation works are required.

At SC1 given the archaeological findings, it is proposed to topsoil strip the area proposed for the compound as an archaeological exercise. Should archaeological features be detected these shall be excavated by a team of archaeologists.

Excavation at SC1 will take place once the utilities have been diverted. The archaeological works will take place in advance of any construction works associated with WP5 and site preparations for SC1. Within the construction programme, a suitable amount of time will be allowed for the archaeological excavation to take place.

At SC3 once the excavation of Ferrybank House has taken place and the stone faced water channel has been recorded monitoring will take place during the relocation of utilities in this area. All clearance and site preparation works will be archaeologically monitored. Should any archaeological finds, deposits or material be encountered all work will cease in that given area and be archaeologically investigated.

The proposed relocation of utility services (powerlines) at Arklow Marsh (Drawing No. 1062) will be archaeologically monitored in advance of the archaeological investigations taking place. If it is decided to bury the powercables, this activity (trenching) will be monitored as well.

At SC6 no further archaeological work is anticipated at the site preparation as no archaeological features were revealed as a result of archaeological testing.

Embankment

The proposed embankment on the north bank (**Drawing Nos 1031** to **1035** inclusive, **Appendix 4.1**) will be constructed running north-south on the eastern side of Arklow Marsh. It will be approximately 545m long. A permanent 4.0m wide track will be constructed along the dry side of the embankment to facilitate future inspection and maintenance.

Once the utilities have been diverted, archaeological inspection and test excavation of the line of the embankment and associated permanent works will take place. The archaeological works will take place in advance of any construction works associated with WP5. Within the construction programme, a suitable amount of time will be allowed for the archaeological investigation to take place.

A programme of archaeological test trenching will be designed in order to establish the presence or absence, as well as the nature and extent, of any archaeological deposits that may be present within the landtake of the Proposed Permanent Works.

Should any subsurface archaeological stratigraphy, material, feature be encountered, an appropriate ameliorative strategy approved by the authorities will be implemented. This will entail licensed archaeological excavation in full or part of any identified archaeological remains (preservation by record) or preservation insitu (by design).

Archaeological Monitoring

Archaeological monitoring licensed by the Department of Housing, Local Government and Heritage is required of all ground and riverbed disturbances associated with the Proposed Scheme.

This will be designed in order to establish the presence or absence, as well as the nature and extent, of any archaeological deposits, features or sites that may be present within the land take of the Proposed Scheme, where ground investigation and earth-moving works are taking place. This includes but is not exclusive to:

- All works taking place within the designated ZAP for the historic town of Wicklow (WI040-029).
- All proposed works to the bridge will be archaeologically monitored and surveyed by an archaeologist experienced in recording bridge structures and working in a riverine environment.
- Archaeological monitoring of works associated with extending downward all the bridge piers, and the excavation and removal of the bridge's stone apron and underlying river shingle will be carried out. This work will be conducted with the aim of recording all bridge elements that are exposed in the course of such works and before such elements may be removed by such works. The monitoring will record fully such features in writing and photographically, and will include metrically accurate measurements and drawings to permit the generation of scaled drawings that illustrate the history of bridge construction that may be revealed in the course of such work.
- All works (including enabling works) within the river including bunds to enable the remedial works for Arklow Bridge, temporary haul roads and the temporary causeway will require archaeological monitoring.
- Construction access roads from RA1, 2, 6 and 7 (**Figure 5.5.3** of **Chapter 5,** *Construction Strategy*) within the river channel will be formed on top of the bunds to run from the river access points to the bridge work areas. These may be located wholly or partially on top of the bunds to avoid and reduce the impact on the work area. The access road will approximately be 4m wide where it meets the public road with suitable protection/ containment of the road edge. This will allow sufficient space for trucks to stop and allow drain water to drain from excavated material. All disturbance of riverbed materials will be monitored by a licensed archaeologist.
- Monitoring will take place at all River Access areas 1-8, in order to identify any features or deposits of an archaeological nature. For example, the bankside works at River Access 4 and 5 will impact on made ground surfaces that are built up over pre-existing ground levels that could retain cultural layers and deposits. This is the case upstream of Arklow Bridge where the works will take place along the south bank that is reclaimed land adjacent to the medieval town and its former harbour.
- Archaeological monitoring of the active dredging phases is required to ensure that material exposed/recovered during the dredging works is recovered and stored securely. Such dredging faces include the works required to establish way leaves and bunds where such work requires the use of river gravels whose excavation have not been previously archaeologically monitored.

The movement and relocation of drainage diversion, utilities and services will require archaeological monitoring.

- Archaeological monitoring will take place in the greenfield and brownfield areas proposed for the compounds and the proposed access roads.
- Archaeological monitoring will take place during the construction of the sheet pile walls along the quays.
- Part of the quay wall is obscured and already encased in concrete or has other additions such as a low plinth attached to the top. It is anticipated that the quay wall will be left in situ and retained behind the sheet pile wall. Where interventions are required, a monitoring archaeologist will undertake a photographic and written record as part of the construction programme. As this section of the quay wall is essential hidden, monitoring will occur as works are scheduled and as areas are revealed.

Archaeological monitoring will ensure the full recognition of, and the proper excavation and recording of, all archaeological soils, features, finds and deposits which may be disturbed below the ground surface and within the Avoca River.

All archaeological issues will be resolved to the satisfaction of the Project Archaeologist, DHLGH and the NMI. The licensed archaeologist will have provision to inspect all excavation to natural soil level and to temporarily halt the excavation work, if and as necessary. They will be given provision to ensure the temporary protection of any features of archaeological importance identified.

Examination of dredged spoils at site compounds

Archaeological monitoring licensed by the Department of Housing, Local Government and Heritage will be required of all ground and riverbed disturbances associated with the proposed scheme.

Archaeological examination of the dredge material by metal detection and visual inspection will be required. The dredge material will be transported to the construction compounds prior to removal offsite. This will provide a second opportunity to assess the archaeological potential of the sediments and recover material of archaeological interest. This archaeological examination will be based on a percentage of the dredge material to be agreed with the National Monuments Service and the National Museum of Ireland. A higher percentage of such monitoring is anticipated for dredge material from archaeologically sensitive locations upstream of Arklow Bridge and from Arklow Bridge itself. A lower percentage is anticipated for dredge materials from downstream of Arklow Bridge, where the archaeological sensitivity is less. Archaeological examination of the dredge material at the various construction compounds is detailed further in Sections 5.3.2 and 5.5.2 below.

Architectural Heritage

The Avoca River played a vital role in the historical development of Arklow's seafaring economy and maritime culture, providing a transport conduit for the import and export of minerals to service the upstream mining activities around Avoca.

In order to provide an appropriate level of flood defence, this scheme will alter the existing river embankments and quay walls and necessitate works to Arklow Bridge, a protected structure (A26). In response to this and in parallel with the civil engineering works, a public realm design has been developed. The objective of the Public Realm project is to ensure the effective integration of the infrastructural project with the townscape and river setting in a manner that seeks to ensure the value of the river frontage in its new form can contribute positively to the townscape taking into consideration the historic and maritime heritage of Arklow (**Drawing Nos. 6545-300-306 Landscape Design and Public Realm – Appendix 4.2**). In the long term, there is a significant positive impact on the architectural heritage structures of Arklow due to the prevention of flooding.

The public realm design has been developed iteratively in collaboration with Arklow WwTP and the Flood Relief Scheme so as to ensure the new infrastructure does not obscure the important downstream elevation of the bridge and that none of the infrastructural components clutter or detract from the character of the bridge.

All works carried out at Arklow Bridge (as detailed in **Section 11.5.2.2** of the EIAR) will be assessed by a conservation engineer.

The conservation engineer will identify suitable locations for vibration monitors to be placed for the duration of works at and in proximity to Arklow Bridge. Vibration monitors will be set in accordance to standard guidance for protected structures (historic buildings). In the unlikely event of vibration limits being exceeded, works will cease and alternative construction methods will be used (**Chapter 9 Noise and Vibration**).

As part of the conservation mitigation measures for Arklow Bridge, the riverbed of Arch 1 is to be reinstated to its original form and Arch 19 is to be retained as is, keeping in place the historic stone scour apron (section 11.5.3.2)(**Appendix 11.8 CORA 2021**).

A detailed methodology of all the proposed interventions in terms of grouting, underpinning (type and combination to be employed) and the lowering of the riverbed will be agreed with a conservation engineer and statutory authorities in advance of the finalised detail design.

Maintenance and localised repair works including vegetation growth, mortar loss, loose stonework, corroding ties and obscured issues behind later shotcrete have been identified as issues to address in the conservation structural report (**Appendix 11.8** CORA 2021). Specifications for repair works are outlined in **Appendix 11.8** within Appendices 4.3 and 4.4 and drawings SK-01-SK-10 (CORA 2021) show where these works need to take place. These works will be undertaken at the appropriate time under the guidance and advice of a conservation engineer.

Works to the masonry of the historic part of Arklow Bridge will include repairs to the previously applied gunite to the soffits of the arches, repairs to the masonry of the older sections of Arklow Bridge and removal of the vegetation growing on the bridge. Defective joints will be raked out and repointed.

Deeply embedded roots will be drilled and injected with a suitable herbicide where to remove them would prove destructive to the integrity of the masonry. All loose stones will be re-seated and eroded mortar raked out and repointed with appropriate mortars. The render to the underside of the arches will be checked for integrity and where defective, removed and the masonry repaired. Areas of render requiring repair / reinstatement will be carried out in materials more appropriate to the original stonework. All works will be in accordance with the Conservation Engineering Report contained in **Appendix 11.8**.

Where required, method statements for the river access areas (RA1, 2, 6 and 7) located in proximity to the bridge structure detailing the construction strategy will be developed for approval from the statutory authorities including the Architectural Heritage Unit of the Department.

A continuous river side promenade will be provided along River Walk and South Quay to Arklow Harbour. From South Green - The Green at South Quay, the promenade will incorporate a section of the original stone wall quay by locating the proposed new flood relief wall inside the original quay wall (**Drawing No. 6545-302, Landscape Design and Public Realm – Appendix 4.2**). A conservation engineer will examine the existing quay wall (**Appendix 11.3, AH6**) and advise on the remedial and repair work.

At Ferrybank to the rear of properties facing onto Ferrybank Road, the setting of structures of an architectural heritage interest will be offset by proposed native woodland planting, landscaping and screening works that will assist in blending in the new works in Arklow Marsh.

Cultural Heritage

There is potential to have a significant, positive and permanent impact on the setting and understanding of the historic maritime significance of Arklow along the new quay side through improved access, upgrading of public realm works and heritage signage.

Where the South Quay wall (AH6, Appendix 11.3) cannot be presented and retained as described in section 11.5.3.5 of the EIAR, it will be recorded. Section 11.5.4.3 of the EIAR describes how the quay wall and river banks will be archaeologically recorded. Where interventions are required, a monitoring archaeologist will undertake a photographic and written record as part of the construction programme. As these sections of the quay wall are essentially hidden or obscured as the wall is encased in concrete or has other additions such as a low plinth attached to the top, monitoring will occur as works are scheduled and as areas are revealed.

The historic slip known as Tyrrell’s slip and boat tracks (AH5) will be recorded by means of photography and written description prior to commencement of works so a full record of the feature is present prior to any interventions. All works in the vicinity of the historic slip will be archaeologically monitored.

Glass panels will be inserted into the flood defence walling proposed across the slip way, so the structure can be viewed. At present there is heritage signage providing information about this feature.

In consultation with interested stakeholders, local heritage groups and the Maritime Museum of Arklow it is proposed to provide a newly developed heritage trail that provides information at points of industrial heritage and maritime interest along the quays.

A seated amenity area (AH8) with an anchor forming the focal point in Tinahask Lower will be enhanced and incorporated into the public realm works.

Features of a cultural heritage interest that are required to be removed on a temporary basis or for a short-term period, will be removed, under archaeological supervision and in accordance with a method statement agreed with the statutory authorities. This will protect the heritage asset from any adverse impacts and ensure that it is stored safely at an agreed location.

Mooring posts (**Appendix 11.3, AH7**) removed as part of the advance works (Section 11.5.3.5) will be reinstated along the south quay reasserting their connection with the original quay wall.

The removal of the ruined and broken up slipway (**Appendix 11.3, AH4**) at Coal Quay will be archaeologically recorded by a written description, photographic and scaled drawing record.

Boat rails (AH15) that traverse the road from a former ship-building yard to Arklow Docks on the Dock Road in Tinnahask Lower townland will be lifted and removed prior to trench excavation taking place for drainage works. The rails will be stored at an agreed location and will be re-instated upon the completion of the works and the resurfaced road.

The Project Archaeologist will ensure that contractors are made aware of features of a cultural heritage interest that align the river at the South Dock and at Ferrybank. If necessary, protection measures such as localised hoarding will be put in place to protect features in situ, for example AH16, Mooring points and AH12, a water pump (**Appendix 11.3**).

At Tinnahask Lower (along the south quay and at the south Dock) it will be important to maintain the authenticity and integrity of the mooring points (Appendix 11.3, AH10) with the original quay wall. While they are movable objects, they are set in the ground and will removed be under archaeological supervision and stored at an agreed and secure location for the duration of the project. The intent is to reinstate them or as agreed with the statutory authorities to move them locally to an optimum location.

In Marsh townland, the infilled stone line water channel (**Appendix 11.9**) that was identified on the northern boundary of SC3 will by archaeologically recorded in advance of works taking place and the area monitored as part of the construction contract.

At Ferrybank, a former laneway (AH1) will be traversed by the permanent works for the embankment. The section of causeway to be impacted will be recorded by a photographic and written survey and these works will be archaeological monitored.

National Monuments Legislation (1930–2004) states that in the event of the discovery of archaeological finds or remains, the National Museum of Ireland should be notified immediately. Provision must be made to allow for, and fund any, archaeological work that may be needed if any remains should be noted during ground preparation works or during construction. As described above, if features are revealed, the area will need to be investigated, allowing no further development to take place until the site is fully identified, recorded and excavated or, alternatively, avoided.

Operation

All heritage issues will be resolved during the pre-construction and construction phase.

An ongoing maintenance review of works to the historic fabric of Arklow Bridge will be undertaken at appropriate intervals by a conservation engineer who will advise if any future remedial works are necessary.

Archaeological monitoring will take place during maintenance clearances at the debris and gravel trap and at periodic and ongoing dredging operations in the river.

21.2.6 Landscape and Visual Impact

Construction

Construction activity and disruption of a physical and visual nature of the townscape, and of the use of the town and its environs, represents the greatest potential impact on landscape/townscape and visual aspects.

Mitigation during construction of all work packages therefore relates to the establishment and maintenance of organised and tidy site and work compounds, and effective management of pedestrian and vehicular diversions.

In addition, where works are close to existing trees that are to be retained, tree protection fencing must be erected in accordance with BS 5837:2012.

The project includes extensive public realm and landscaping proposals that will be implemented during the construction stage after the heavy civil engineering works and will gradually mitigate the construction appearance and deliver the new public realm and landscaping. Details of these works are included in **Appendix 4.2** of the EIAR, **Dwgs 300 to 306** inclusive.

A Construction Environmental Management Plan (CEMP) will be required to ensure the mitigation measures set out above are implemented during construction, and that any shortcomings are remedied immediately. A CEMP is included in **Appendix 5.1** of the EIAR**.** The appointed contractor will have a community liaison office to liaise with residents and other stakeholders in advance of establishing working areas so as to ensure such working areas have the minimum potential impact of residents and their properties.

Operation

Mitigation measures for the flood defence project are primarily inherent in the multi-disciplinary design of the flood defence infrastructure together with the wider and associated public space, public amenity and streetscape modifications that are included in **Appendix 4.2** of the EIAR, Dwgs 300 to 306 inclusive. These also include details of tree and landscape planting proposed at different areas throughout the project.

Planting

Tree/landscape planting will be undertaken to address the loss existing vegetation and terrestrial habitat to accommodate the FRS.

- **Dwg 300**: River Walk (South Bank) Planting proposed: Semi-mature tree species proposed include: *Acer platanoides* 'Columnare' (Norway Maple), *Betula pendula* (Birch), *Crataegus laevigata* 'Paul's Scarlet' (Hawthorn), *Pinus sylvestris* (Scot's Pine), *Prunus avium* 'Plena' (Double flowered Wild Cherry). Ornamental shrubs and perennials, amenity grass.
- **Dwgs 301**, **302** and **303**: South Quay to Arklow Harbour (South Bank) - Planting proposed: Semi-mature tree species proposed include: *Acer platanoides* 'Columnare' (Norway Maple), *Ulmus* "Lobei" (Elm), *Prunus avium* 'Plena' (Double flowered Wild Cherry). Ornamental shrubs and perennials, amenity grass.

At Arklow Marsh adjacent to the proposed embankment and at the extension to the north river bank upstream of Arklow Bridge, landscaping proposals include:

- Native Woodland planting (Area No 1) is along the new extended north bank of the river (Refer to **Dwg 304**) comprising: *Alnus glutinosa* (Black Alder), *Salix aurita, Salix cinerea oleifolia, Salix caprea, Salix petrandra* (Willow) and *Betula pubescens* (Downy Birch).
- Irish Native species rich grass and wildflower mixture along the river side of the new floodwall on north bank (SC3) and along the length of the embankment (Refer to **Dwg 304**, **305** and **306**).
- Native Woodland planting (Area No 2) along the east side of the embankment and in SC1 (Refer to **Dwg 304**, **305** and **306**) and comprising: *Alnus glutinosa* (Black Alder), *Salix spp.*(Willow) and *Betula pubescens* (Downy Birch), *Prunus spinosa* (Blackthorn), *Crataegus monogyna* (Hawthorn) and *Viburnum opulus* (Guelder Rose).

The physical changes along River Walk and South Bank will be mitigated by the public realm proposals combined with tree and shrub planting as described in **Dwgs 300** to **303** in **Appendix 4.2** of the EIAR).

Arklow Bridge

The main works to the bridge are associated with physical strengthening and underpinning of the bridge, and with limited if any change in the appearance and character of the Arklow Bridge above water level. Maintaining and enhancing the visual integrity of the bridge has been a key objective of the design process.

The proposals maintain full visibility of the 19 arch structure, and the design of the interface with South Quay presents a clean, contemporary and high quality wall detail that clearly distinguishes the historic bridge structure from the new flood defence structures.

The interlocking rocks that form the scour protection under the arches will be reinstated under arches 1 and 19 at their existing level. Existing lighting on Arklow Bridge will be reinstated upon completion of the bridge works.

River Dredging

Once river dredging has been completed during the construction, there is no ongoing landscape/townscape impact associated with this work package. There may be occasional routine channel maintenance dredging and clearance of vegetation if the levels of gravels and vegetation become a risk to blockage.

Mitigation measures included in the design for the loss of the small group of in-channel bushes and vegetation close to the north bank, and removal of the gravel banks that facilitate gathering of colonies of birds at low tide, include extension of the northern river bank to provide additional habitat areas, and also the provision of three floating roosting platforms anchored to the river bed upstream of Arklow Bridge.

Debris and Gravel Traps

Mitigation associated with the introduction of the debris and gravel trap infrastructure includes locating these elements closer to the built environment of the town core rather than further upstream in a more natural environment. This keeps any new built elements such as the debris trap piers within the built context of the town, and also ensures that periodic access for gravel trap clearance is kept within the built environment of the town core.

Additionally, such periodic maintenance access will be facilitated through the establishment of a temporary causeway within and across the river channel that will be accessed from a small permanent access ramp located upstream of the debris and gravel trap on the south bank. The temporary causeway will be removed entirely following clearance of the debris and gravel traps.

Southern Flood Defences

Mitigation associated with the southern flood defences has been described in **Chapter 12** under Operational Effects and is focussed on the integrated design for the civil engineering infrastructure of the flood defences of the public realm and open spaces along the south bank.

The primary design objectives have been to seek to maintain the height flood defence wall along the riverside promenade at 1,150mm so as to maintain the visual connection with the river and north bank. The provision of the promenade itself as a major public realm enhancement, together with landscaping and general streetscape enhancements, and raised pathways, terraces and viewing areas, all contribute to reinventing how the river edge is used in combination with the flood defences.

The materials used are of high quality, with the inner face of the wall being clad in textured concrete panels, and paving materials being of a natural stone finish. Additionally, and as the flood wall is c. 400mm thick, it has been possible to include a capping profile on the wall that is chamfered so that the vertical surface of the wall is only 900mm high, with the additional 250mm being formed across the chamfer. This has the effect of the wall appearing lower towards the promenade while maintaining its effective flood defence height.

At River Walk, where the height of flood defence is greatest, a series of elevated pathways and terraces, combined with ramps, steps, landscape areas and raised viewing platforms are designed to bring pedestrians along the upper levels with only 1,150mm height of wall between them and the river, and to add visual diversity and amenity along River Walk. These facilities also extend over the wall onto the river edge where a separate pathway, together with a terrace, stepped terrace and a floating pontoon are all accessible to the public along the edge of the water.

Northern Flood Defences

Mitigation of the north flood defences includes minimising the encroachment into the Arklow Town Marsh by keep the embankment as far eastwards as possible, and by including newly established areas of river bank where the defences join the Avoca River so as to facilitate the reinstatement of river edge planting and to provide new habitat areas along the river bank.

New mixed woodland planting will be provided between the embankment and the rear of the existing properties at Ferrybank and this woodland planting will extend northwards and into the lands that will be used for Site Construction compound number 1.

Maintenance access to the embankment will be from the Dublin Road with a permanent access track along the eastern side of the embankment ensuring no additional impact on the Arklow Town Marsh.

Monitoring during operation relates principally to the maintenance and aftercare of new public realm and landscaping as appropriate to ensure appropriate presentation of the built environment and proper establishment of soft landscape. Any plants or trees that fail will be required to be replaced in the next available planting season.

21.2.7 Land and Soil

Construction

As outlined in **Section 5.5** of **Chapter 5** of the EIAR and in the CEMP (Refer to **Appendix 5.1** of the EIAR), the adopted construction techniques will comply with the requirements of statutory bodies (inspections by the Health and Safety Authority and the Office of Public Works inspections and compliance with Employer's Requirements).

Mitigation measures for erosion and sediment control are primarily addressed in **Chapter 14**, *Water* of the EIAR (Section 21.2.8 below). Mitigation measures for accidental leaks and spills are in the CEMP (Refer to **Appendix 5.1** of the EIAR).

During construction, the following generic measures will be used to avoid or reduce the significance of potential impacts:

Encountering known or unknown existing contamination

- The historical illegal dumping of waste on Arklow Town Marsh has been recovered by WCC:
    - Should any further illegal dumping take place on the site these materials will be removed by WCC prior to works commencing.
    - A site investigation to determine the quality of soils and groundwater within the working area in Arklow Town Marsh will be conducted prior to intrusive works to determine if soil or groundwater contamination is present in the working area.
- During enabling works, a suitable geotextile membrane with be installed at all site compounds where historical land use indicates potential contamination may be present, to avoid interaction with overlying storage materials or equipment. At SC1 topsoil will be stripped and a suitable geotextile membrane will be installed and overlaid with hardcore. Intrusive works will not take place on SC2 and SC5, a suitable geotextile liner will be installed and overlaid with hardcore. SC3 is the site of a demolished house and is partly hard cored. Topsoil will be stripped from the western side of the property and a suitable geotextile membrane will be installed and overlaid with hardcore. SC4 is located on an existing carpark. SC5 is a semi-derelict site with a largely hardcore base, a suitable geotextile liner will be installed in an area of soft soils on the site compound. At SC6 topsoil will be stripped and a suitable geotextile membrane will be installed and overlaid with hardcore.
- A bund system, as described in **Section 5.4.3** of **Chapter 5**, *Construction Strategy*, will be installed at site compounds SC1, SC2, SC5 and SC6 to contain stored dredge materials so it is not anticipated that there will be interaction between materials stored at site compounds and any underlying existing contamination, if present. All hazardous material will be stored in bunded site compounds.

If contamination is encountered in geology, soils or groundwater, suitable measures will be put in place to avoid mobilising the contamination based on the most appropriate industry best practice guidance for contaminated land management. These measures, should they be required, will be documented in the soil management plant and revised as needed.

Accidental leaks and spills

A contingency plan for accidental leaks and spillages is included in the CEMP and will be further developed by the contractor prior to the commencement of the works and regularly updated during construction.

This contingency plan identifies the actions to be taken in the event of a pollution incident in accordance with the CIRIA guidance 741 *Environmental good practice on site*, and includes:

- Containment measures;
- Emergency discharge routes;
- List of appropriate equipment and clean-up materials;
- Maintenance schedule for equipment;
- Details of trained staff, location and provision for 24-hour cover;
- Details of staff responsibilities;
- Notification procedures to inform the EPA or Environmental Department of the Wicklow County Council;
- Audit and review schedule;
- Telephone numbers of NPWS and IFI; and
- List of specialist pollution clean-up companies and their telephone numbers.

The plan must include adequate measures and processes to ensure that any spillages will be immediately contained, and that contaminated soil will be removed from the proposed development and properly disposed at a suitable facility.

Measure to avoid and reduce the risks of minor leaks and spill are set out in the CEMP (**Appendix 5.1** of the EIAR), as are good housekeeping measures which also contribute to avoiding leaks and spills. These include:

- Potential pollutants will be adequately secured against vandalism and will be provided with proper containment according to the relevant codes of practice.
- Vehicles and equipment will be maintained by a suitably trained person and checked on a regular basis.
- Daily vehicle and equipment checks will include a visual assessment for oil or lubricant leaks prior to use.
- Vehicles will be parked on hardstanding areas overnight or when not in use, as applicable.
- Vehicles will minimise tracking over natural, exposed or unfinished surfaces, where practicable.
- Vehicles will not track over recently reinstated soils.
- Drip trays will be placed underneath any standing machinery to prevent pollution by oil/fuel leaks during refuelling. Where practicable, cleaning and refuelling of vehicles and machinery will be carried out on an impermeable surface in one designated area well away from any watercourse or drainage.
- Good housekeeping in line with industry best practises (e.g. CIRIA) will be adhered to including daily site clean-ups, use of disposal bins, etc.).

- Discharges from dredge material stored in site compounds are not considered an accidental leak or spill and the construction strategy contains measures designed to avoid and reduce any potential negative impacts to underlying soils and land, including through use of geotextile lines and bunds, as appropriate, at site compounds and the adoption of a procedure of temporary halts of loaded haulage vehicles on slopes within an appropriate vicinity of the river source to allow for drainage to remain within the source area, thus minimising movement of discharge across the site.

Use of imported materials during construction

See **Chapter 15**, *Resource and Waste Management* of the EIAR.

Compression of Substrata

All WPs:

- Ground settlements will be controlled through the selection of a foundation type and method of construction which are suitable for the particular ground conditions,
- Excavations shall be kept to a minimum, using shoring or trench boxes where appropriate. For more extensive excavations, a temporary works designer will be appointed to design excavation support measures in accordance with all relevant guidelines and standards.

WP5: The potential impact of the installation would likely to be localised to the vicinity of the footprint of the embankment and works would be temporary. Soft soils will be removed during construction of the foundation to create a stable base and a geotextile membrane will be placed over the formation to strengthen the foundation. During construction of foundations, stump holes will be filled and compacted by power-driven hand tampers. Additionally, if a silty or clayey foundation soil has a high-water table and high degree of saturation, the surface will be compacted using lightweight compaction equipment. This activity will be confined to the footprint of the embankment and will take place after stripping and storage of topsoil. The embankment will be constructed of suitable, compacted materials to ensure stability.

Potential impact on surrounding ground

Ground settlements will be controlled through the selection of a foundation type and method of construction which are suitable for the particular ground conditions.

WP1: Mitigation measures for ground stability during intrusive works is designed into **Chapter 5**, *Construction Strategy* of the EIAR and chiefly comprises the grouting works at Arklow Bridge and the temporary works design.

During WP4 and WP5, at some locations, existing walls will be retained for flood defence walls, where practicable – Refer to **Chapter 4** of the EIAR.

Appropriate dewatering methodologies must be used (see **Chapter 5**, *Construction Strategy* for further detail).

Trafficability of soils

During all WPs:

- Significant project vehicle and equipment movements will be along agreed predetermined routes along existing national, regional and local routes. Where compaction occurs due to truck movements and other construction activities on unfinished surfaces, remediation works will be undertaken to reinstate the ground to a condition if at least equal quality to the original surface.
- Vehicles will minimise tracking over natural or unfinished surfaces, where practicable.
- Vehicles will not track over recently reinstated soils, should these be present.
- River access will be constructed of a suitable hard material such as hardcore
- Heavy vehicles and equipment will be parked on hardstanding areas overnight or when not in use, as applicable.
- Where practicable, compaction of any soil or subsoil which is to remain in situ in the works area will be avoided.
- Care will be taken to ensure that the side slope surfaces of bunds and haul roads are stable to minimise erosion.

In WP1, the river access may be developed on top of the bund to minimise the extent of potential impacts and reduce the overall effects, if practicable.

In WP2, where suitable, inert dredge material may be used as infill material in the construction of the embankment during WP5.

Loss of geology and soils

All WPs:

- A soil management plan is included in the CEMP and will be developed further by the contractor prior to the commencement of the works and updated, as required, during construction. This plan identifies the actions that will be taken to avoid reducing the quantity of soils present on the site. Measure will include:
    - Topsoils and subsoils will not be mixed
    - Soil stockpiles will be covered with suitable materials
    - Vehicles will not track over recently reinstated soils, should these be present.
- Care will be taken to ensure that the side slope surfaces are stable to minimise erosion. This will be achieved through the selection of suitable material and adoption of an appropriate side slopes. If there is insufficient space to allow for a suitable side slopes, supports to sides will be provided by precast concrete traffic barriers.
- Suitable inert material will be used as infill, wherever this is required,

- Where possible excavated material will not be stockpiled within 10m of the Avoca River or the channel in the Arklow Town Marsh. Where this measure is not implementable, then specific silt control measures will be implemented as part of the detailed method statement for site works in each specific area (refer to **Chapter 5**, *Construction Strategy* of the EIAR for detail).
- Precautions will be taken to minimise the runoff of soils into watercourses through the implementation of erosion and sediment control measures as set out in the **Chapter 14**, *Water* of the EIAR.
- Soil and materials will be transported in appropriate dump trucks to minimise the loss of material in transport.
- Earthworks operations will be carried out such that surfaces will be designed with adequate falls, profiling and drainage to promote safe runoff and prevent ponding and flooding.
- Soils removed during excavation activities will be reinstated where possible.

During all Work Package with in-river work areas:

- Bunding of any in-river working areas with be used to minimise the loss of riverbed or bank sediments
- Bunds will be formed of suitable inert materials. These will generally be formed from permeable material with an impermeable liner such as heavy-duty polythene or sandbags.

During WP 4 and WP5:

- All excavated material will, where possible, be reused as construction fill. The appointed contractor will ensure acceptability of the material for reuse for the proposed development with appropriate handling, processing and segregation of the material.
- This material will have to be shown to be suitable for such use and subject to appropriate control and testing according to the Earthworks Specification(s). These excavated soil materials will be stockpiled locally within the working area where possible, using an appropriate method to minimise the impacts of weathering. Care will be taken in reworking this material to minimise dust generation, groundwater infiltration and generation of runoff. Any surplus suitable material excavated, that is not required elsewhere for the proposed development, will shall be used for other projects where possible, subject to appropriate approvals/notifications.
- It is anticipated that excavated topsoil will be reused in soft landscaping, where practicable.
- Water for disposal will be pumped to sedimentation tank before discharge to canal or river.

Potential impact of dewatering - in river dewatering

An appropriate dewatering methodology will be selected for works. This will consider the risk of any ground instability arising from dewater activities to potentially sensitive receptors in proximity to the works area.

Arklow Bridge will be considered a sensitive receptor in WP1. Sensitive structures are comprised of material assets and would typically include but not be limited to, nearby buildings, highways, and protected structures.

During WP1 and WP3:

- Discharge from the dewatering process will be passed through a proprietary silt removal system located within the working area where possible, before discharge to the Avoca River.
- Industry best practices will be followed in the use of bunds.

During WP 3 there will be two stages of stage development in the construction of the debris trap, where on completion of the northern half of the debris trap, the bund material will be removed and used to form a bund around the southern half of the debris trap.

For mitigation measures for potential impact on surrounding ground from dewatering, refer to subsection '**Potential impact on surrounding ground'** above.

Potential impact of dewatering - terrestrial dewatering

An appropriate dewatering methodology will be selected for works. This will consider the risk of any ground instability arising from dewater activities to potentially sensitive receptors in proximity to the works area. Sensitive structures would typically include but not be limited to, nearby buildings, highways and protected structures such as Arklow Bridge.

During WP1, WP3, and WP4:

- Discharge from the dewatering process will be passed to a proprietary silt removal system located within the working area before discharge to the Avoca River.

For mitigation measures for potential impact on surrounding ground from dewatering, refer to subsection '**Potential impact on surrounding ground'** above.

Potential impact on bedrock aquifer.

Mitigation not proposed as impact is considered to be negligible.

Excavations in made ground will be monitored by an appropriately qualified person to ensure that any contaminated material is identified, segregated and disposed of appropriately. Any identified hotspots shall be segregated and stored in an area where there is no possibility of runoff generation or infiltration to ground or surface water drainage. Care will be taken to ensure that the hotspot does not cross-contaminate clean soils elsewhere.

Any excavation shall be monitored during earthworks to ensure the stability of side slopes and to ensure that the soils excavated for disposal are consistent with the descriptions and classifications according to the waste acceptance criteria testing carried out as part of the site investigations. Refer to **Chapter 15**, *Resource and Waste Management* of the EIAR.

Monitoring for settlement will take place during in all work packages, refer to **Chapter 5**, *Construction Strategy* of the EIAR for details.

Operation

Mitigation measures, proposed for the construction phase, will be implemented for maintenance operations, where relevant.

Maintenance of debris trap and gravel trap

WCC will adhere to OPW guidance (Brew and Gilligan 2019) to ensure due care is taken during debris and gravel trap clearance and periodic routine dredging prior to works commencing. Suitable permanent river access measures will be developed during construction for river access.

WCC will undertake appropriate testing of materials prior to their removal from the river to determine the physio-chemical properties of material and classify the material so it can be identified as suitable for reuse or disposed of at an appropriate facility. Refer to **Chapter 15,** *Resource and Waste Management* of the EIAR for detail on the management of general construction waste during operations.

Appropriate testing of dredged material to identify potential contamination will be undertaken prior to dredging and at suitable intervals during dredging.

Installed infrastructure

Ongoing routine inspection of the infrastructure for leaks will be carried out during operation.

21.2.8 Water

Construction

Hydrology and Flood Risk Management

Sequencing of Works

The planned construction sequence of the work packages has been selected to ensure that there is no increase in the current flood risk from fluvial and coastal sources during construction. WP1 which includes the bridge underpinning and lowering of the floor of Arklow Bridge, is due to be carried out at the beginning of the scheme and will result in a reduced flood risk, once it has been completed.

The completion of the first section of the bridge works will provide sufficient benefit to allow the commencement of WP4, the construction of flood defence walls along the south bank, ensuring that there will be no increase in flood risk due to the construction of the WP4 works.

WP3 includes the construction of the gravel and debris traps and is planned for the first summer. These works will reduce the risk of blockage of Arklow Bridge and so, reduce flood risk further.

WP5, the construction of the flood defence embankment and wall on the north bank will follow the completion of WP1, WP3 and WP4 and though it will increase flood levels, it will result in an overall reduction in the current flood risk. WP2, the dredging works, will be carried out at the same time as WP5 and will reduce the flood risk further.

Work Package 1: Bridge Underpinning, remedial and scour protection

There will be an increase in flood risk during the first stage of the bridge works due the temporary bunds in the river channel. The proposed mitigation measures to manage this increased flood risk are:

- Works will be carried out in the summer months when river flows and wave action are typically lower.
- Bund heights will be set at a level so that they will be effective during the expected range of river flows and tide levels for the summer months but will be overtopped if exceptional large events occur.
- A flood monitoring and warning system will be implemented so that all plant and equipment will be removed from the work areas in the event of an imminent large river flow or exceptional high tide.
- In the event of a warning of an extreme flood event, the temporary bund will be reduced in height or removed in part or entirely if time allows to further reduce any flood risk.
- The Works Contractor will be required to take measures to mitigate any increase in flood risk arising from his activities. This will include measures to safely evacuate the working area, monitoring of water levels (see also below) and weather patterns.

After the first section of works are completed, the increased capacity of the bridge arches in this section will provide additional conveyance capacity and offset any impact on conveyance due to the temporary bunds for the middle and northern sections of the bridge.

The increase in flooding risk due to the construction of WP1 following the above mitigation measures is considered to be imperceptible temporary.

Work Package 2: Channel Dredging

The proposed dredging works upstream and downstream of Arklow Bridge have the potential to increase flood risk due to the construction of haul roads within the river channel, parallel to the banks and across the channel. These haul roads may impact on the conveyance capacity at the narrower sections of the channel. Factors for the mitigation of flood risk are as follows.

- The dredging works will be carried out in the summer months when river flows and wave action are typically lower.
- The haul roads will be set at a level so that they will be effective during the expected range of river flows and tide levels for the summer months but will be overtopped if exceptional large events occur.

- Flood levels from coastal processes will not be impacted by the proposed temporary works.
- The bridge underpinning works will be completed thereby increasing the conveyance capacity through the bridge and offsetting and increase in flood levels upstream of Arklow Bridge.
- An increase in flood levels upstream of the proposed dredge works will not impact properties due to the high ground levels on the south bank and the marsh on the north bank upstream of the haul roads. Flood flows will be able to flow through the marsh if levels are sufficiently high and bypass the narrower section of river channel at the upstream extent of the dredging works.
- The Works Contractor will be required to safely evacuate working area, during monitoring of water levels and when extreme weather patterns occur.

The potential increase in flooding risk due to the construction of WP2, following the above mitigation measures, is considered to be imperceptible temporary.

Work Package 3: Debris and Gravel Trap

The construction of these works will impact on flood levels upstream of the proposed location for the traps due to the construction of the haul road and bund within the river. The following mitigation measures will be implemented:

- Construction of the debris and gravel traps will not impact on flood risk as the increase in flood levels will only occur upstream of the works area and flood flows will be retained by the high ground levels on the south bank. Flood flows will be able to flow through the marsh if levels are sufficiently high and bypass the works.
- The works will be carried out in the summer months when river flows are typically lower.
- The haul road and bund will be set at a level so that they will be effective during the expected range of river flows for the summer months but will be overtopped if exceptional large events occur.
- A flood monitoring and warning system will be implemented so that all plant and equipment will be removed from the work areas in the event of an imminent large river flow.
- In the event of a warning off an extreme flood event, the temporary bunds can be reduced in height or removed in part or entirely if time allows to further reduce any flood risk.
- The Works Contractor will be required to safely evacuate working area, during monitoring of water levels when extreme weather patterns occur.

It should be noted that an increase in flood levels upstream of the proposed debris trap works will not impact properties due to the high ground levels on the south bank and the marsh on the north bank upstream of the proposed works.

Flood flows will be able to flow through the marsh and bypass the work area if levels are sufficiently high.

The potential increase in flooding risk due to the construction of WP3 following the above mitigation measures is considered to be imperceptible temporary.

Work Package 4: Flood Defences and storm water drainage works on South Bank

The construction of the temporary causeway for approximately 300m within the river channel to facilitate the construction of the sheet-piled wall downstream of Arklow Bridge will increase flood risk from a fluvial flood event. It will not change the flood risk from a coastal flood event. The proposed causeway will not be constructed until the first section of the bridge underpinning, and associated lowering of the floor of Arklow Bridge, is completed. Consequently, the temporary causeway will not increase flood risk over the current level.

A temporary causeway will also be constructed within the river channel for approximately 120m upstream from Arklow Bridge to facilitate construction of the sheet-piled wall along River Walk. The temporary causeway will be contained on the river side by either gabions or sheet piles, with these raised to the height of the causeway, to be effective. The proposed elevation of the temporary causeway is c. 0.8m OD which accounts for highwater mean spring tide of 0.5m OD plus 0.3m freeboard.

As the causeway will be constructed within the wider section of the river channel, it will not impact on fluvial flood flows. The proposed causeway will not be constructed until the first section of the bridge underpinning, and associated lowering of the floor of Arklow Bridge, is completed. Consequently, the temporary causeway will not increase flood risk over the current level.

The Works Contractor will be required to safely evacuate from river channel during flood risk arising from his activities.

The potential increase in flooding risk due to the construction of WP4 following the above mitigation measures is considered to be imperceptible temporary.

Work Package 5: Flood earth embankment and flood defence wall along North bank

The construction of the proposed flood defence embankment and wall will not commence until the bridge underpinning and associated lowering of the floor of Arklow Bridge is fully completed. As such, the proposed embankment and wall will not increase flood risk over the current level.

The Works Contractor will be required to safely evacuate from river channel during flood risk arising from his activities.

Monitoring

The following monitoring will be carried out during the construction stages:

- Visual monitoring of river levels during instream work will be carried out in the morning, during midday and in the evening by observing the staff gauges at Arklow Bridge and the Dock. In the event that the Arklow Bridge gauge has to be removed temporarily to facilitate construction works, a temporary gauge will be established at the opposite (north) end of the bridge.
- Monitoring the weather forecast for heavy rainfall events and river water levels will be carried out twice daily.
- Monitoring of the tide forecast will be carried out twice daily.
- Advance monitoring of extreme weather conditions will also be carried out.

Existing Drainage Infrastructure

Where the existing drainage system requires diversion or alteration during construction, the contractor responsible will be required to have alternative drainage facilities in place. These may include temporary diversions if a suitable route for gravity flow is available or over-pumping where a gravity solution cannot be identified.

Water Quality

In order to further reduce any potential effect of the dredging on migrating fish species e.g. Lamprey and Salmon, dredging will not be carried out between October and April.

The standard best practice measures in the CEMP (**Appendix 5.1** of the EIAR) for the proposed scheme will mitigate significant negative effects on surface water quality during construction. A range of site-specific measures are presented below:

- During construction, contaminated surface water runoff in working areas will be collected by the temporary drainage systems installed by the contractor and then treated or desilted on-site before discharge to the Avoca River or stored and removed off site if not suitable for discharge to the Avoca.
- Site compound SC1, where archaeological testing of the dredged material including material with slightly elevated chloride concentrations will be conducted, will be prepared with the installation of a geotextile membrane with suitable hardcore placed over it to provide a trafficable surface. Arklow Marsh pNHA will be protected by a temporary low bund constructed of impermeable material. The bund will be situated along the western boundary and will redirect surface water run off towards siltation traps. Dredge material will be managed in an area situated on the south eastern portion of SC1 behind Circle K filling station. A low bund will be installed around the area on top of geotextile membrane and hardcore material. A localised stormwater drainage system will be constructed within the area to convey runoff to a sedimentation collection system before percolating into the ground.

The collection system will be periodically monitored during material testing. Silt fences will be installed around stockpiled material.

- Site compound SC2, where archaeological testing of the contaminated dredged material will be conducted, will be prepared with the installation of a geotextile membrane and an impermeable membrane with suitable hardcore placed over these to provide a trafficable surface. A low bund, comprising precast concrete traffic barriers or similar wrapped in an impermeable membrane, will be constructed around the perimeter of the site to retain the temporary surface and the dredged material.
- A drainage channel with sumps will be constructed around the perimeter of the storage area to collect any water draining from the dredged material. Water draining from contaminated material stored at SC2 and will be collected in a suitable tanker to be taken to a suitable waste disposal facility. Groundworks operations will be carried out such that the surfaces are provided with adequate slope to promote safe runoff and prevent flooding.
- Site compound SC5, where archaeological testing of the dredged material with slightly elevated chloride concentrations will be conducted, will be prepared with the installation of a geotextile membrane with suitable hardcore placed over it to provide a trafficable surface. A suitable bund will be constructed around the storage area.
- Water draining from the material at SC5 will be allowed to drain by overland flow to the sea. Groundworks operations shall be carried out such that the surfaces are designed with adequate falls to promote safe runoff and prevent flooding.
- Site compound SC6, where archaeological testing of the inert dredged material will be conducted, will be prepared with the installation of a geotextile membrane with suitable hardcore placed over it to provide a trafficable surface. A suitable bund will be constructed around the storage area. A drainage channel with sumps will be constructed around the perimeter of the storage area to collect any water draining from the dredged material. Any runoff will be discharged through a suitable sediment removal system for discharge.
- Good housekeeping such as site clean ups, use of disposal bins etc will be adopted in construction areas.
- In order to prevent accidental release of hazardous materials such as fuels, lubricants, cleaning agents, hazardous construction materials, etc. into surface water during construction, all hazardous materials will be stored within appropriately bunded containment areas designed to retain spillages.
- Dewatering will be achieved using a series of sump and submersible pumps and discharging through a suitably sized propriety sediment removal system. The contractor will regularly maintain the sedimentation tank to ensure that it is not full of sediment. This is aims to prevent pollution of the Avoca River through the release of sediments.

- Locations where contaminated material are anticipated, will be isolated at low tide level. A temporary bund made up of impermeable material, approximately 500mm above high spring tide level will be constructed around the location. Dewatering for visibility of the riverbed and to enable the contractor to carry out the excavation process will be undertaken. A conventional excavator will be used to remove any layers of contaminated material. The excavation will extend approximately 300mm below the proposed dredge level and will be back filled with clean dredged material. The finished excavated surface will be trimmed to the required line and level at the channel edge. This will have an imperceptible temporary negative impact on water quality.
- The grouting process at Arklow Bridge will be preceded by water flushing to determine if there are any paths through to the face of the historic masonry. Any routes found will be plugged with mortar appropriate to the historic masonry. The grouting material will consist of cement only or a mixture of cement and bentonite, depending on the purpose of the grouting and the permeability of the material to be grouted.
- Dredging works in the river will be confined to either the northern half or the southern half of the channel at any one time to minimise the impact of suspended sediment in the water.
- Dredging works in the river will be limited to 10 hours per day to allow 14 hours for the water to clear and any migratory aquatic species to travel past the work area.
- Restricting the dredging hours, as described above, will also limit the impact on coastal waters off the mouth of the estuary. Sediment plumes emanating from the Avoca River estuary are an existing feature of high flows in the Avoca River.
- Refer also to specific pollution control measures detailed in Section 21.2.4 *Biodiversity* above and summarised below:

    i. Appropriate sediment control measures will be employed.

    ii. Any chemical, fuel and oil stores will be located on an impermeable base within a secured bund with a storage capacity 110% of the stored volume.

    iii. Biodegradable oils and fuels will be used where possible.

    iv. Drip trays will be placed underneath any standing machinery to prevent pollution by oil/fuel leaks. Where practicable, refuelling of vehicles and machinery will be carried out on an impermeable surface in one designated area well away from any watercourse or drainage (at least 10m).

    v. Emergency spill kits will be available on site and staff trained in their use.

vi. Operators will check their vehicles on a daily basis before starting work to confirm the absence of leakages. Any leakages will be reported immediately.

vii. Daily checks will be carried out and records kept on a weekly basis and any items that have been repaired/replaced/rejected noted and recorded.

viii. Any items of plant machinery found to be defective will be removed from site immediately or positioned in a place of safety until such time that it can be removed. All items of plant will be checked prior to use before each shift for signs of wear/damage.

ix. All washing out of grout pumps will be carried out in designated areas away from the river, such as in the lined compound area. At no point will grout pumps be washed out at the worksite.

- Specific mitigation measures regarding the careful application of herbicide to treat Invasive Alien Plant are presented the Invasive Alien Plant Species Management Plan in the CEMP (**Appendix 5.1** of the EIAR).
- Specific mitigation measures regarding the careful application of herbicide to remove woody vegetation in the joints in the masonry of the bridge during WP1 are presented the CORA report (**Appendix 11.8** of the EIAR)

Water Quality Monitoring during Construction

River water quality monitoring will be carried out for a period of twelve months in advance of the works to establish a baseline for water quality. Parameters to be monitored will include suspended solids, dissolved oxygen, temperature, pH, turbidity and BOD_5. During the course of the works, monitoring will be continued and any significant changes will be investigated. Construction practices will be adjusted if found to be having an unacceptable negative impact on water quality.

Monitoring will be carried out both upstream of the proposed works and downstream to ensure that any changes in the levels of these parameters do not create an unacceptable condition for aquatic life in the river (Refer to **Chapter 14** *Water* of the EIAR for baseline water quality parameters). Monitoring will be carried out in the morning, midday and mid-afternoon.

Silt Management Procedures

Silt management onsite will be carried out in accordance with OPW Guidance as described below. This mitigation procedure will be adopted across all site compounds and working areas.

i. A suitably qualified Environmental Clerk of Works shall be appointed to oversee and monitor all measures taken to protect the aquatic environment;

ii. Ensure works area within waterbody does not become dry in an unmanaged fashion, killing fish or other aquatic species;

iii. Monitor the effectiveness of any installed silt control measures,

iv. Minimise increase silt levels, when removing control measures,

v. Manage site compounds and work area runoff effectively including wheel washing of transport;

vi. Minimise in-channel works and design temporary haul roads and crossing points effectively, to allow fish transition at all times;

vii. Management excavated spoil and dredge material effectively;

viii. Consider allowing river to return to background silt levels when required, use turbidity monitoring or other data manage effectively

ix. Ensure reporting procedure in place in the event of a pollution event;

Operation

Hydrology and Flood Risk Management

No mitigation will be required during the operation of the scheme as the proposed scheme will improve the flow regime in the Avoca River towards the Irish Sea and the net impact is moderate medium-term significantly positive effect.

There will be on-going recording of water levels in the Avoca river, to monitor any immediate change in flood risk and to provide a long-term assessment of any change in flood risk due to changes in climatic conditions and/or catchment characteristics.

Water Quality

The proposed scheme will moderate medium-term positive impact on water quality in the Avoca River preventing flood waters from washing contaminants from land-based activities into the river and out to sea. Channel maintenance will be carried out within the river channel, sediment plume development will occur during this period. Accidental spills and leakages will be mitigated by measures already described above.

Provision of localised location for the removal of gravel and debris and carrying out the works during summer are positive mitigation measures. Gravel removal from the gravel trap will be limited to a maximum of 10 hours in a 24-hour period, as and when required. This will lead to a positive medium-term effect on water quality in the Avoca Estuary.

On-going monitoring of water quality is proposed during the operation. It is envisaged that WCC and EPA will continue to monitor the water quality under the River Basin Management Plan in compliance with the Water Framework Directive after completion of the scheme.

During the maintenance operations which will involve works in the river and adjacent to it such as the channel maintenance dredging, debris and gravel trap maintenance, water quality monitoring will be carried out as described above for construction stage.

21.2.9 Resource and Waste Management

Construction

A Construction and By-Products Waste Management Plan (CBWMP) has been prepared (refer to **Appendix 15.4** of the EIAR). This CBWMP plan will be required to be updated by the contractor(s) following appointment and prior to commencing works on site. The CBWMP addresses waste generation and arrangements made for prevention, reuse, recycling, disposal and collection of recyclables and wastes.

The CBWMP has been prepared in line with the guidance[1]. The CBWMP addresses the following:

- Description of the project (refer to **Chapter 4** and **Chapter 5** of the EIAR);
- Wastes arising including procedures for minimisation/segregated storage/reuse/recycling;
- Estimated cost of waste management;
- Roles and responsibilities for implementing the CBWMP;
- Procedures for training of workforce and plan dissemination programme;
- Record keeping procedures;
- Waste collectors, and recycling and disposal sites including copies of relevant permits or licences; and
- Waste auditing protocols.

Using the information identified in this section, the contractor(s) will be required to update the CBWMP, with its/their detailed procedures and the names of staff with assigned roles in the plan prior to commencement of construction, and as required during the construction of the proposed scheme.

In addition to the inherent design measures which will be implemented during construction, the following mitigation measures will be implemented:

- A pre-demolition audit will be undertaken in order to facilitate selective demolition. Selective demolition will be undertaken in order to enable removal and safe handling of hazardous substances and to facilitate re-use and high-quality recycling. The pre-demolition audit will be undertaken in accordance with the EU *Guidelines for the waste audits before demolition and renovation works of buildings* (European Commission, 2018), or similar guidance. The aim of the guidance is to facilitate and maximize recovery of materials and components from demolition or renovation of buildings and infrastructure for beneficial reuse and recycling, without compromising the safety measures and practices outlined in the EU *Construction and Demolition Waste Management Protocol* (European Commission, 2016). The above guidelines provide guidance on best practices for undertaking a ‘waste audit’,

[1] DoEHLG (2006) Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects.

i.e. the assessment of construction and demolition waste streams prior to demolition or renovation of buildings and infrastructures.

- The contractor will minimise waste disposal so far as is reasonably practicable. Opportunities for reuse of materials, by-products and wastes will be sought throughout the construction stage of the proposed scheme.
- Possibilities for re-use of clean non-hazardous excavation material as fill on the site or in landscaping works will be considered following appropriate testing to ensure material is suitable for its proposed end use. Where excavated material may not be re-used within the proposed works the contractor will endeavour to send material for reuse on another site, recovery or recycling so far as is reasonably practicable.
- Waste from the proposed scheme will be transported by authorised waste collectors in accordance with the Waste Management (Collection Permit) Regulations, 2007 as amended.
- Waste from the proposed scheme will be delivered to authorised waste facilities in accordance with the Waste Management Acts 1996, as amended.
- Source segregation: Where possible metal, timber, glass and other recyclable material will be segregated and stored separately, during construction and removed off site to a permitted/licensed facility for recycling. Waste stream colour coding will be used to facilitate segregation and each container will have photographs of wastes to be placed in that container, as required. Where waste generation cannot be avoided source segregation will maximise the quantity and quality of waste delivered for recycling and facilitate its movement up the waste hierarchy away from landfill disposal and reduce its environmental impact.
- Material management: ‘Just-in-time’ delivery will be used so far as is reasonably practicable to minimise material wastage.
- Materials will be stored in appropriate conditions, and if outdoors, will be raised above the ground and covered, as required, to prevent deterioration and spoiling due the effects of the weather.
- Supply chain partners: The contractor will engage with the supply chain to supply products and materials that use minimal packaging, and segregate packaging for reuse.
- Waste Auditing: The contractor will record the quantity in tonnes and types of waste and materials leaving site during the construction phase.
- Waste fuels/oils may be generated from equipment used on-site during construction and may be classified as hazardous waste. Such wastes will be stored in a secure, bunded area on-site prior to collection by a contractor who holds the appropriate waste collection permit.
- The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity of waste in tonnes delivered to each facility. Records will show which material is recovered and which is disposed of.

- The contractor(s) will ensure that any off-site interim storage or waste management facilities for excavated material have the appropriate waste licences or waste facility permits in place.

Export of hazardous waste from the proposed scheme out of the State is subject to a Europe-wide control system founded on EU Regulation 1013/2006 on the Shipments of Waste (known as the Transfrontier Shipment Regulations), as amended. A Trans Frontier Shipment (TFS) licence is a licence which must be approved by the origin/destination/transit authorities consenting to the movement/transit and acceptance of wastes between EU member states. This licence tracks waste from origin to destination and ensures that each authority is aware of the status of the waste until final recovery when the individual TFS notification annex consigned with each shipment is signed off as having been received and treated by the receiver. This completed licence is then circulated back to the producer as well as all relevant authorities

EU Regulation 1013/2006 is supplemented by the Waste Management (Shipments of Waste) Regulations 2007, as amended, which makes Dublin City Council responsible for the enforcement of this regulatory system throughout Ireland. Export of hazardous waste from the site out of the State will comply with the procedures set out in this legislation. The above procedures will be applied to any hazardous waste generated during the construction phase.

The monitoring, as specified in the CBWMP and CEMP (Appendix 5.1 of the EIAR) in relation to wastes, will be undertaken and recorded by the contractor(s).

Operation

The mitigation measures described above will be implemented, where relevant, during the operation and maintenance of the proposed development.

Monitoring of the maintenance waste generated during the operational phase will be carried out to determine its appropriate suitability for re-use, recovery or disposal off site.

21.2.10 Population and Human Health

The mitigation and monitoring measures relating to construction and operation of the proposed flood relief scheme have been addressed in the specific assessment chapters of the EIAR, as follows:

- **Chapter 7** *Traffic and Transport* of the EIAR,
- **Chapter 8** *Air Quality and Odour* of the EIAR,
- **Chapter 9** *Noise and Vibration* of the EIAR,
- **Chapter 11** *Archaeological, Architectural and Cultural Heritage* of the EIAR,
- **Chapter 12** *Landscape and Visual* of the EIAR,
- **Chapter 13** *Land and Soils* of the EIAR,
- **Chapter 14** *Water* of the EIAR,

- **Chapter 15** *Resource and Waste Management* of the EIAR,
- **Chapter 17** *Material Assets* of the EIAR,
- **Chapter 18** *Major Accidents and Disasters* of the EIAR,
- **Chapter 19** *Climate* of the EIAR,
- **Appendix 5.1 Construction Environmental Management Plan (CEMP)** of the EIAR.

From the perspective of the Population and Health assessment, the mitigation proposed in these chapters is sufficient to address potential effects on sensitive receptors including pedestrians, cyclists, residents, businesses and visitors, and for amenity activity, especially during the summer and for festivals and tourism events.

In addition to the above, a Pest Control Plan has been included in the CEMP, as outlined in **Chapter 16** *Population and Human Health* of the EIAR, in order to ensure the control of pests in the spreading of the dredge material.

Further, access to the existing slipway and set-down pontoon at Arklow Harbour/Dock will be maintained during the summer months (June-August).

21.2.11 Material Assets

Construction

As described in **Chapter 5,** *Construction Strategy* of the EIAR and outlined in **Appendix 5.1** of the EIAR, the contractor will be required to prepare and maintain a CEMP during the construction phase of the proposed scheme. The appointed contractor will be required to comply with the CEMP. Effective implementation of the CEMP will ensure that disruption and nuisance are kept to a minimum throughout the construction of the proposed scheme. The CEMP will be required to have regard to the guidance[2] and industry best practice. The CEMPs will be effective throughout construction and the contractor will be required to review and update the CEMP as construction progresses.

Every effort will be made to ensure that any significant effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme.

Land and Property Ownership

Wherever possible, mitigation by avoidance of negative effects on property was a priority during the design development of the proposed scheme. However, as outlined in **Chapter 17** *Material Assets* of the EIAR, the proposed scheme will require land take to accommodate construction activities and to accommodate control and maintenance of flood relief measures within the foreshore, during the operational phase.

[2] CIRIA (2015) Environmental Good Practice on Site Guide, 4th Edition

Access to all residential properties will be maintained at all times during the construction of the proposed development. This may require temporary alternate access arrangements at some locations.

Landowners will be compensated as appropriate for land acquisition, in accordance with the relevant legislation. The details of any individual agreements will be private and confidential and therefore mitigation measures in the form of compensation are not specific or detailed herein.

It is proposed that closure of the existing slipway and set-down pontoon at Arklow Harbour/Dock be avoided during the summer months (Jun-Aug).

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

Electricity and Lighting

All utilities and service diversions will be agreed and undertaken as part of the enabling works and in advance of the commencement of construction activities. In the event of disruption to services- these will be planned and communicated to the public in advance and carried out in accordance with the relevant codes of practice.

All construction activities in the vicinity of existing services and utilities will be carried out in ongoing consultation with the relevant service provide and undertaken in compliance with any requirements or guidelines they may have.

Temporary construction lighting will be provided throughout the duration of the construction phase in lieu of the public lighting.

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

Telecommunications

The contractor will be obliged to put measures in place to ensure that there are no interruptions to existing utilities and services unless this has been agreed in advance with the relevant service provider. All construction activities in the vicinity of existing services and utilities will be carried out in ongoing consultation with the relevant service provide and undertaken in compliance with any requirements or guidelines they may have.

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

Gas

The contractor will be obliged to put measures in place to ensure that there are no interruptions to existing utilities and services unless this has been agreed in advance with the relevant service provider.

All construction activities in the vicinity of existing services and utilities will be carried out in ongoing consultation with the relevant service provide and undertaken in compliance with any requirements or guidelines they may have.

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

Water Supply Infrastructure

The contractor will be obliged to put measures in place to ensure that there are no interruptions to existing utilities and services unless this has been agreed in advance with the relevant service provider. All construction activities in the vicinity of existing services and utilities will be carried out in ongoing consultation with the relevant service provide and undertaken in compliance with any requirements or guidelines they may have.

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

Sewer Network and Drainage Infrastructure

The contractor will be obliged to put measures in place to ensure that there are no interruptions to existing utilities and services unless this has been agreed in advance with the relevant service provider. All construction activities in the vicinity of existing services and utilities will be carried out in ongoing consultation with the relevant service provide and undertaken in compliance with any requirements or guidelines they may have.

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

Additional Material Assets

Construction phase mitigation measures have been proposed to ensure that significant negative effects on material assets will be avoided, prevented or reduced during the construction of the proposed scheme. As such, no monitoring measures are proposed during the construction phase.

Operation

Land and Property Ownership

Landowners will be compensated as appropriate for permanent land acquisition, in accordance with legislation. The details of any individual agreements will be private and confidential and therefore mitigation measures in the form of compensation are not specific or detailed in this EIAR.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

Electricity and Lighting
Lighting which was removed as part of the construction works for the proposed scheme will be reinstated or replaced during operation.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

Telecommunications
No mitigation measures regarding telecommunications are proposed during the operational phase of the proposed scheme.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

Gas
No mitigation measures regarding gas infrastructure are proposed during the operational phase of the proposed scheme.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

Water Supply Infrastructure
No mitigation measures regarding water supply infrastructure are proposed during the operational phase of the proposed scheme.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

Sewer Network and Drainage Infrastructure
No mitigation measures regarding the sewer network and drainage infrastructure are proposed during the operational phase of the proposed scheme.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

Additional Material Assets
No mitigation measures regarding the drainage channel or pipeline are proposed during the operational phase of the proposed scheme.

As no significant, negative operational effects of the proposed scheme on material assets are identified, no operational monitoring measures have been proposed.

21.2.12 Major Accidents and Disasters

Construction

The appointed contractor's proposed method and sequence of working will be highly critical in maintaining the overall stability of the bridge and the appropriate stipulations will be incorporated into all tender and construction documents to make sure this process is adhered to.

Operation

No mitigation or monitoring measures are proposed specific to reducing the risk of major accident/disaster during operation.

21.2.13 Climate

As no significant adverse effects are predicted to occur during the construction or operation of the proposed development, no mitigation measures are required.

21.3 Residual Significant Effects

This EIAR has been prepared by competent experts in accordance with Article 1(2)(g) of the EIA Directive to identify the likely significant effects associated with the proposed scheme in accordance with the relevant legislation and guidance.

A range of likely significant effects have been avoided or reduced through the implementation of mitigation measures and monitoring, therefore leading to the residual effects as outlined in **Sections 21.3.1-21.3.13**.

21.3.1 Traffic and Transport

The construction of the proposed scheme will result in a slight increase in traffic congestion within the town, particularly when construction works are taking place on Arklow Bridge. These effects will be temporary in nature and following the completion of the construction works will have no residual effects.

During all construction stages, the individual working areas will result in some restrictions and inconvenience to the movement of people and traffic. These restrictions will be temporary in nature and particularly felt in the immediate vicinity of the proposed working areas.

Should the construction of the Arklow Flood Relief Scheme coincide with the construction of the Arklow Wastewater Treatment, there will be a greater increase in traffic in Arklow resulting in a temporary slight increase in traffic congestion along the primary road network. It expected that at North Quay, South Quay, South Green and Tinahask Road that the impacts on traffic delays and queuing will be greatest should the two construction projects be carried out in tandem, however these temporary impacts will be over a shorter duration.

During the operation of the proposed scheme the projected increases in traffic flows will be very small, with only occasional service traffic expected.

The annual removal of material from debris trap will have a temporary and short-term impact on traffic movement in the operational phase but impacts will be significantly less than those stated in construction impact assessment.

The proposed maintenance dredging of the river channel which is proposed approximately every 10 years will result in temporary and short-term effects on traffic movement. These effects will similarly be less than those stated in construction impact assessment.

21.3.2 Air Quality and Odour

With the implementation of the mitigation measures, no significant adverse residual negative effects on air quality are envisaged during the construction or operation of the proposed development.

Similarly, with the implementation of the mitigation and monitoring measures, no significant adverse residual negative effects on odour are envisaged during the construction phase of the proposed development.

21.3.3 Noise and Vibration

A noise assessment of the construction phase impacts has shown that compliance with noise limit values in can be achieved at the nearest sensitive receptors to the proposed works for WP1 (daytime) and WP2. For all other WPs, noise limits are predicted to be exceeded at the nearest sensitive receptors.

The implementation of the mitigation measures outlined in **Section 9.6** of **Chapter 9** of the EIAR and in Section 21.2.3 above will assist in reducing the impact on nearby sensitive receptors. Residual short-term, slight to moderate negative impacts are predicted during the construction phase of the proposed development. **Table 21.1** summaries the residual impacts during the construction phase.

Table 21.1 Summary of Residual Impacts During Construction Phase

Construction phase	Summary of impact Post Mitigation
WP1 – daytime assessment	Short term, slight and negative.
WP1 – night-time assessment	Short term, slight and negative.
WP2 – daytime assessment	Temporary, slight and negative.
WP3 – daytime assessment	Temporary, slight to moderate, and negative.
WP4 – daytime assessment	Short term, slight to moderate, and negative.

Construction phase	Summary of impact Post Mitigation
WP5 – daytime assessment	Not significant to moderate, short term and negative.

No residual impacts are predicted during the operation and maintenance phase of the proposed development.

21.3.4 Biodiversity

Habitats and Flora

With the implementation of the mitigation measures, residual effects on habitats and flora, are assessed as not significant during construction and operation.

Diadromous Fish Species

With the implementation of mitigation measures, residual effects on diadromous fish from construction and operation are assessed as not significant. No likely significant direct residual effects will arise diadromous fish from discharges during construction and operation.

Resident Bird Species

With the implementation of the mitigation measures, residual *in situ* effects on the resident bird species, are assessed as not significant during construction and operation.

Otter and Badger

With the implementation of the mitigation measures, residual effects on resident otter and badger, are assessed as not significant during construction and operation.

Bat Species

With the implementation of the mitigation measures specified in **Section 10.6** of the EIAR, residual effects on species including Habitats Directive Annex IV listed bat species (Common pipistrelle, Soprano pipistrelle, Leisler's bat and Daubenton's bat), are assessed as not significant during construction and operation.

21.3.5 Archaeology, Architecture and Cultural Heritage

No residual effects were identified during the course of the assessment on heritage assets.

Should any archaeological remains be uncovered, they will be fully resolved prior to the main construction stage where possible, either through preservation in situ or preservation by record.

There is an opportunity to provide a coherent and cohesive cultural heritage identity, incorporating the maritime and industrial heritage features of the town's historic past into the proposed public realm design works.

The provision of information panels at features and items of an historical heritage interest will result in a slight positive residual effect on cultural heritage.

21.3.6 Landscape and Visual Impact

Residual landscape/townscape effects will generally relate to the widening and alteration and enhanced public realm of South Quay and River Walk, the presentation of the Avoca River corridor leading through the town, and also the embankment along the eastern side of the Arklow Town Marsh.

In relation to the Arklow Town Marsh, the nature of the marsh and existing vegetation is such as to preclude taking baseline eye-level photography for the purposes of preparing photomontages to illustrate landscape and visual effects. The latter are nonetheless described in the foregoing and predicted to be localised, moderate and adverse.

Beyond the Arklow Town Marsh, residual landscape/townscape effects will vary considerably throughout the townscape of Arklow town and these are described with reference to the series of photomontage views prepared from 11 representative locations throughout the proposed development and included in **Appendix 12.1** of the EIAR**.** The photomontage view locations are shown in **Figure 12.20** in **Chapter 12** of the EIAR.

Photomontages

View 1

View 1, **Figure 12.1.1** in **Appendix 21.1** of the EIAR, is from River Walk as existing upstream of the carpark as is where River Walk transitions from is riverine and rural upstream character to its riverine and urban setting. The north bank is clearly defined by strong mixed woodland edge. River Walk includes built elements such as the retaining walls to the rear of properties and parts of the carpark and road network with the town are coming into view. The river bank is a simple grass bank incorporating a number of early mature and mature trees.

View 1, **Figure 12.1.2** in **Appendix 21.1** of the EIAR, shows the proposed development with the main intervention being the introduction of the ramped River Walk pathway and associated floor defence wall along the river edge leading to a cantilevered viewing platform at the high point and the removal of the existing river bank trees. Additionally, the debris trap columns are readily visible traversing the river and the permanent ramp access for maintenance is visible in the foreground. The absence of the existing river bank trees is notable however this also opens up the wider view of the river corridor. The proposed development brings the rural to urban transition along River Walk slightly upstream from its current location.

Landscape and visual effects will be perceived as moderate and adverse, however will become positive as the amenity value of the revised river edge detail within the urban setting is fully realised.

View 2

View 2, **Figure 12.2.1** in **Appendix 21.1** of the EIAR, is from the junction of River Walk and River Lane adjacent to the town carpark and looking upstream along the Avoca River. The existing low flood defence wall defines the edge of the footpath and roadway and there is a short section of river bank formed in concrete that provides passive amenity at the river edge. The heavily wooded north bank is distinctive and the occasional trees on the south bank are visible together with the trees on the grass embankment between River Walk and the carpark.

View 2, **Figure 12.2.2** in **Appendix 21.1** of the EIAR, shows the proposed development including the flood defence wall at c. 1.85m above River Walk and leading to the newly ramped section of River Walk beyond and the cantilevered viewing platform at the high point. The flood defence wall will be at its highest at this location however it will incorporate glass panels so as to permit visibility to the river corridor and also to the proposed new terrace area, walkway and floating mooring platform.

Whereas the current junction of River Walk and River Lane is primarily a vehicular carriageway, the proposed development will transform the junction to one of high pedestrian amenity with stronger and more direct connections along River Walk and to the town carpark

Landscape and visual effects are likely to be perceived initially as significant and adverse, however in the context of the new continuous river promenade and enhanced public realm along the southern river bank throughout the town, this will reduce over time as the change becomes accepted and the full amenity value of River Walk within its urban context is realised.

View 3

View 3, **Figure 12.3.1** in **Appendix 21.1** of the EIAR, is from River Walk near Condren's Lane and illustrates the simple yet attractive green space on the inside of the low flood defence wall overlooking the river where there is a concrete pathway. Car parking can be seen to the right and the carriageway of River Walk runs along the parking area before the rear boundary walls of private properties. The Arklow Bridge is apparent in the distance however it is the modern 1960s concrete side that presents upstream to River Walk. There are a number of trees of mixed species and maturity within the landscaped space and in the river bank.

View 3, **Figure 12.3.2** in **Appendix 21.1** of the EIAR**,** shows the proposed development including the flood defence wall at typically c. 1.15m above the proposed promenade and terrace level, with some sections following the profile of the outer pedestrian ramp as it rises to meet the elevated viewing platform cantilevered over the wall and river. The carriageway level remains at its existing level however the promenade and terraces are elevated and separated from the carriageway by low planters that will also serve as permanent seating. The promenade and terraces are distinctly pedestrian in character, with high quality paving and bespoke precast polished concrete panels to finish the wall. Dual lighting provides for the pedestrian spaces and carriageway, and comprises LED luminaries with high cut-off so as to minimise any light spill to the river corridor. Parking spaces are defined along the carriageway and new tree planting will be

provided to enhance to overall character of River Walk and to further reinforce the elevated promenade as a pedestrian only zone.

The proposed development will represent a substantial change along River Walk as the visual connection with the river corridor will be less open that at present, however, the enhanced public realm and amenity space along River Walk will provide a high quality and attractive amenity and visual and physical connections to the river will be maintained over the walls and from the elevated viewing platform and fully accessible outer pedestrian ramps.

Landscape and visual effects are likely to be perceived initially as significant and adverse, however the new high quality pedestrian environment will ultimately draw additional pedestrian activity to River Walk and to the river area, and the revised public space will become a positive asset for the town.

View 4

View 4, **Figure 12.4.1** in **Appendix 21.1** of the EIAR, is also from River Walk approaching the Arklow Bridge and opposite the existing café. The river edge includes a concrete pathway and a low flood defence wall. A buffer space between the wall and carriageway incorporates sections of landscaping, car parking and a small paved are that serves as a spill out area for the café. The floor levels of the café and adjoining buildings are raised and ramps are required to access these premises.

View 4, **Figure 12.4.2** in **Appendix 21.1** of the EIAR**,** shows the proposed development including the new flood defence wall constructed further into the river channel. The new wall alignment facilitates a substantial increase in pedestrian and amenity space along the river front, and this will be developed as raised terrace areas that are continuous with the overall river front promenade and incorporate raised and flush planters with new tree planting and ground cover landscaping. The carriageway level between the terraces and buildings will be paved as a shared surface, but will also be raised so as to eliminate the need for ramped access to the properties along River Walk. The public space is primarily pedestrian, with private vehicular access only to the apartment building and for café deliveries. The widened River Walk will become an attractive and high quality riverfront space that is a destination along the overall promenade and will support existing businesses at River Walk and catalyse further regeneration. The flood wall is only 1.15m above the elevated terrace level permitting direct visibility of the river corridor and yet incorporates three sections of glazing so as to ensure visual connection for those seated on the terraces.

The proposed development will represent a substantial change along River Walk as the visual connection with the river corridor will be less open that at present, however, the enhanced public realm and amenity space as a destination and gathering point along the promenade will provide an attractive amenity space for the town and contribute to further redevelopment and regeneration along River Walk.

Landscape and visual effects may be perceived initially as moderate and adverse, however the establishment of a new high quality public space will ultimately result in moderate and positive landscape and visual effects.

View 5

View 5, **Figure 12.5.1** in **Appendix 21.1** of the EIAR **,** is from Bridge Street approaching River Walk and provides an open and attractive view to the north bank and upstream of the Avoca River and of River Walk. The vehicular character of River Walk is apparent and the rear boundary walls of the properties are just out of view. A narrow pedestrian ramp leads from Bridge Street to the concrete walkway along the river bank.

View 5, **Figure 12.5.2** in **Appendix 21.1** of the EIAR**,** shows the proposed development including the new flood defence wall constructed further into the river channel and facilitating the establishment of a substantial new public space along the river front.

The new terraces areas are contiguous with the overall proposed river front promenade and are elevated so that the flood defence wall is only 1.15m high and facilitates views over the wall to the river corridor. Additionally, sections of glazing are incorporated into the wall so as to ensure visual connections with the river for those seated on the terraces. The terraces include multiple stepped and ramped connections to the lower shared surface carriageway that optimise permeability between the buildings and businesses at River Walk and the river front public space. The terraces also include raised and flush planters with new tree planting and ground cover to further enhance the amenity value of the public space.

The proposed development will represent a substantial change along River Walk however the changed visual relationship with the river corridor will be offset by the establishment of a high quality public amenity space and landscape and visual effects will ultimately be moderate and positive.

View 6

View 6, **Figure 12.6.1** in **Appendix 21.1** of the EIAR, is from the Arklow Bridge looking upstream toward River Walk and illustrates the existing low level of the river edge and the mixed quality and usage of River Walk for both pedestrian and vehicular use. Ornamental planting defined the pedestrian ramp connection to Bridge Street and occasional trees of varying maturity and species are apparent further upstream along River Walk. As the view is taken close to low tide, the gravel beds used by roosting birds are visible within the river channel.

View 6, **Figure 12.6.2** in **Appendix 21.1** of the EIAR, shows the proposed development including new alignment and height of the river edge defined by the new concrete faced wall, with the additional parapet height above the elevated River Walk promenade expressed as a high quality concrete finish with a precast concrete capping and sections of glazing at each of the main terrace areas. The parapet wall leads to the elevated cantilevered viewing platform at the bend in the river further upstream. New tree planting is visible along River Walk.

The scale and extent of the flood defence infrastructure is more readily apparent when viewed from the river channel. It is noted that the view was photographed close to low tide and presents the worst case scenario and the wall be less prominent at higher tide levels. Rip rap will be placed along the river edge where hydrological requirements permit so as to soften the visual appearance of the bottom of the wall where is joins the water. The use of different concrete finishes will also assist in reducing the vertical scale of the wall.

The proposed development will represent a substantial change in the appearance of the river bank as a continuous built element along River Walk replaces a more diverse range of river edge conditions. Landscape and visual effects will initially be perceived as significant and adverse, however this will reduce over time to moderate as the public space along River Walk establishes and the new construction becomes weathered and more established.

View 7

View 7, **Figure 12.7.1** in **Appendix 21.1** of the EIAR**,** is from the Arklow Bridge looking upstream towards the north bank and Arklow Town Marsh and illustrates the existing riverine character and mixed woodland setting of the river corridor. The view is taken close to low tide and the gravel can be seen just below the water in the foreground together with the row of in channel bushes and vegetation towards the north bank.

View 7, **Figure 12.7.2** in **Appendix 21.1** of the EIAR**,** shows the proposed development including the removal of the in channel vegetation, extension of the north bank into the river, modifications to the north bank adjoining the Arklow Bridge and one of the three floating roosting platforms.

Post construction, there will be a noticeable change in the existing river bank character and consequent significant adverse landscape and visual effects, however, as the new mixed woodland planting on the extended north bank and the native species rich grass and wildflowers on the embankment become established, the revised landscape will become more visually integrated with the background and landscape and visual effects will become minor and adverse.

View 8

View 8, **Figure 12.8.1** in **Appendix 21.1** of the EIAR**,** is from the Arklow Bridge looking downstream toward South Quay and illustrates the existing low level of the river edge and the mixed quality and usage of South Quay and the diversity of building types and ages on the Quay. The narrow width of South Quay approaching Arklow Bridge is clearly visible and elements of the existing drainage infrastructure can be seen along the outside of the quay wall. The photograph is taken close to low tide and presents close to the worst case scenario in this regard.

View 8, **Figure 12.8.2** in **Appendix 21.1** of the EIAR, shows the proposed development including the new alignment of the river edge defined by the new

concrete faced wall, with the additional parapet height required for flood defence above the level of South Quay expressed as a high quality concrete finish with a precast concrete capping. New tree planting is clearly visible as a continuous feature along South Quay that will define the new promenade located immediately behind the parapet wall.

As with View 6 of River Walk, the scale and extent of the flood defence infrastructure is more readily apparent when viewed from the river channel. Rip rap will also be placed along the river edge where hydrological requirements permit so as to soften the visual appearance of the bottom of the wall where is joins the water. The same approach to using different concrete finishes as at River Walk will also assist in reducing the vertical scale of the wall.

The proposed development will represent a substantial change in the appearance of the river bank as a continuous built element along River Walk replaces a more diverse range of river edge conditions.

Landscape and visual effects will initially be perceived as significant and adverse, however this will reduce over time to moderate as the new high quality and tree-lined promenade amenity is established the new construction of the flood defence wall weathers.

View 9

View 9, **Figure 12.9.1** in **Appendix 21.1** of the EIAR**,** is from South Quay near South Green where the cappings of the original quay wall can be seen forming the quay edge and the historic granite mooring posts are located in the grass verge. Young street trees are set within the quayside grass verge at regular spacings and are mostly *Acer platanoides* (Norway Maple) and category C2. The carriageway is wide and there are no footpath on either side of the road. Wide grass verges and extended driveways form the residential side of the roadway.

View 9, **Figure 12.9.2** in **Appendix 21.1** of the EIAR**,** shows the proposed development including the provision of a new promenade along the river front and the establishment of the parapet section of the flood defence wall up to a height of 1.15m above promenade. New tree planting will be located in the new grass verge between the promenade and the carriageway provide a distinctly pedestrian amenity that is segregated from the carriageway. The parapet will be clad in polished precast concrete panels and profiled cappings such that the inner edge of the parapet is c. 900m high and rising to 1.15m at the outer edge.

The proposed development will represent a substantial change in the appearance of South Quay however the provision of a dedicated high quality tree-lined public promenade with inherent flood defence will ultimately result in landscape and visual effects that are moderate and positive.

View 10

View 10, **Figure 12.10.1** in **Appendix 21.1** of the EIAR**,** is from South Quay at the Tyrell slipway and illustrates South Quay becoming narrower towards the slipway and the presence of the original boatyard rail lines set in the roadway and

leading to the slipway. A low flood defence wall is located either side of the slipway and a demountable barriers are in place at the head of the slipway.

View 10, **Figure 12.10.2** in **Appendix 21.1** of the EIAR**,** shows the proposed development including the provision of a new promenade along the river front, the establishment of the parapet section of the flood defence wall up to a height of 1.15m above promenade and reconfiguration of the carriageway so as to provide continuous pedestrian facilities and landscaped verges along both sides of South Quay. The carriageway at the slipway be paved and the original boatyard rail lines retained and expressed in the paving and the line of the rails will also be expressed in the paving pattern across the promenade to the head of the slipway. Glazing panels will be incorporated within the parapet wall along the head of the slipway so to preserve the historical connection between the former boatyard and the slipway and river. Interpretive panels will be installed along the parapet wall to provide historical information about the boatyard

The proposed development will give rise to landscape and visual effects that are moderate and positive.

View 11

View 11, **Figure 12.11.1** in **Appendix 21.1** of the EIAR**,** is from South Quay at the Sea Farer's Memorial Garden. The amenity has evolved over time with the help of the local community and is an appropriate an important memorial to those members of the Arklow community who served and were lost at sea. While the amenity has been maintained, it is in part suffering lack of investment and upkeep. It is also located beside an exceptionally wide double road junction that cuts it off from the residential side of the quays. Trees include the Norway Maple at regular spacings along the kerb side as well as a number of ornamental Coryline within the space.

View 11, **Figure 12.11.2** in **Appendix 21.1** of the EIAR, shows the proposed development including the continuation of the proposed promenade along South Quay leading to and connecting with memorial garden. The carriageway and adjoining junction are rationalised and paved as a raised table to as to reduce vehicular dominance and speed and provide a more pedestrian friendly environment. The memorial garden will be repaved using a similar high quality paving material to the promenade and seating, the anchor and interpretive panel will be refurbished or replaced as appropriate. New trees consistent with those of the overall promenade will be planted in the adjacent landscape spaces and the flood defence parapet will be extended along the memorial facing the river channel.

The proposed development will give rise to landscape and visual effects that are moderate and positive.

21.3.7 Land and Soil

With the implementation of the proposed mitigation measures and monitoring, the effect of the proposed development on land and soils is considered to be of negligible magnitude and imperceptible significance during construction and operation.

The significance ranking of 'imperceptible' is the lowest ranking available in the NRA (2008) impacts assessment methodology. The majority of potential impacts are considered to be of 'imperceptible' significant prior to mitigation. The residual effects during construction are considered for the following features that rank of greater significance than 'imperceptible' prior to mitigation.

Trafficability of soils

It is anticipated that the mitigation measures will reduce the 'magnitude' of the potential impact ranking to 'negligible' and the residual significance ranking of the potential impact will be 'imperceptible'.

Loss of geology and soils

It is anticipated that the mitigation measures will reduce the 'magnitude' of the potential impact ranking to 'negligible' and the residual significance ranking of the potential impact would be 'imperceptible'.

The residual significance remains 'slight' for loss of geology and soils where dredge is permanently removed from the river bed.

Accidental leaks and spills

Mitigation measures are proposed to reduce the risk of leaks or spills occurring by adopting measures to avoid leaks or spills occurring and/or to reduce the degree of the potential impact should leaks or spills occur. It is anticipated that the mitigation measures would reduce the magnitude of attribute to 'negligible' during all work packages and the residual significance ranking of the potential impact would be 'imperceptible'. This considers the risk of normal 'day-to-day' activities and minor incidents and does not include major accidents which are discussed in **Chapter 18,** *Major Accidents* of the EIAR.

Encountering known or unknown existing contamination

Mitigation measures are proposed to reduce the likelihood of encountering and/or disturbing contamination, and accidently transporting contamination across of beyond the scheme area. It is anticipated that the mitigation measures would reduce the 'magnitude' of the potential impact ranking to 'negligible' for all work packages and the residual significance ranking of the potential impact would be 'imperceptible'.

Neutral residual effects are anticipated during operation, with periodical localised and short-term dredging used to prevent the continual accumulation of materials at the gravel trap and debris trap during maintenance activities.

The residual significance ranking of the potential impacts would likely be 'imperceptible' to 'slight' and in line with Work Package 3.

21.3.8 Water

Hydrology and Flood Risk Management

With the implementation of the mitigation measures, a imperceptible temporary negative impact will occur during the construction of the first section of the bridge underpinning and new scour slab.

With the implementation of mitigation measures**,** it is expected that this residual risk can be effectively managed.

There will be no significant residual effect on hydrology and flood risk during construction.

The hydraulic modelling of the proposed flood defences indicates an improved flow regime through Arklow Bridge by restricting flooding along Ferrybank and Dublin Road and along River Walk and South Quay and adjoining streets.

All 19 arches of Arklow Bridge will be underpinned and lowered by 1m which will mitigate against rise in flood levels upstream of the Avoca Bridge. Channel dredging for upstream and downstream of Arklow Bridge by 1m will also improve the flow regime.

Flood defences along North Quay within the Arklow Town Marsh will mitigate flooding of properties along Ferrybank and Dublin Road. Therefore, there will be an overall significant reduction in the existing flood risk following construction of the proposed scheme which will be a moderate medium to long term positive effect.

During operation, river flow will be confined in-channel with a freeboard allowance of 300mm to 600mm above the design flood level for flood defences along River Walk and South Quay on the south bank and along the marsh on the north bank. Therefore, a significant positive residual impact on flood risk is expected during operation of the proposed scheme.

Drainage

There will be no significant residual effect on drainage during construction.

Water Quality

With the implementation of the mitigation measures and monitoring measures included in **Chapter 14** *Water* of the EIAR**,** the residual effects on water quality will be imperceptible temporary negative during the construction of the proposed scheme and not cause any deterioration in the overall status of the water quality once the works are completed.

During operation, the proposed scheme will convey fluvial flow (including surface water run-off) in-channel towards the Irish Sea. Through reducing flood risk along north and south bank, pollutants from adjacent properties will not be conveyed to the Avoca River thereby providing a slight short-term positive impact. The collection of sediment at the gravel trap upstream of the Arklow Bridge will allow sediment to be removed at a single controlled location which will have a slight short-term negative impact. Maintenance dredging of the channel will be occasionally required. It is expected that this activity will have a short-term negative impact.

It should be noted that the sheet pile wall constructed as part of the proposed scheme will also serve as advance works for the interceptor sewers to be built as part of the proposed Arklow WwTP Project. It is recognised that once constructed, the proposed Arklow Wastewater Treatment Plant Project would bring about further positive, cumulative effects on water quality.

Overall:

- the residual effect on surface water quality of the affected surface water bodies will be short-term positive impact from the operation of the proposed scheme;
- the scheme will not cause any medium or long-term deterioration in either the overall status or the status of each individual quality element of the relevant water bodies;
- the scheme will not prevent the RBMP objective of protecting/enhancing/restoring the affected water bodies to Good Status and in fact will assist in reaching this objective.

21.3.9 Resource and Waste Management

Following implementation of the mitigation measures, the residual effects are as follows:

- The residual effect of site clearance and demolition waste on the capacity of waste management facilities and waste industry trends in Ireland is expected to be slight, negative and short-term.
- The residual effect of land based excavation waste on the capacity of waste management facilities and waste industry trends in Ireland is expected to be slight, negative and short-term.
- The residual effect of excavation waste from the riverbed on the capacity of waste management facilities and waste industry trends in Ireland is expected to be slight, negative and short-term.
- The residual effect of general construction waste on the capacity of waste management facilities and waste industry trends in Ireland is expected to be imperceptible and short term.
- The residual effect of operational waste on the capacity of waste management facilities and waste industry trends in Ireland is expected to be imperceptible and long term.

21.3.10 Population and Human Health

Residual effects during construction are expected, with regards traffic movements, the economy and tourism and amenity. These will range from slight-significant but will be temporary in nature.

During all construction stages, the individual working areas will result in some restrictions and inconvenience to the movement of people and traffic. These

restrictions will be temporary in nature and particularly felt in the immediate vicinity of the proposed working areas. A slight negative but temporary residual effect on local traffic movements is therefore identified during the construction phase of the proposed scheme.

Works on the bridge during the first three summers will occur close to businesses, including the hotel at Bridge Street and cafés on River Walk, with access to the bridge supports being needed from each corner of the bridge. During the construction phase of the proposed scheme, construction traffic movement has the potential to impact on business access and have an economic impact, but this should not be significant. Restrictions on car parking, and the removal of approximately half of the ~80 spaces at the Main Street Car Park during this time, will have an impact on local businesses, although spaces will be maintained for people with disabilities. It is intended that access for deliveries and pedestrians will remain, although occasional disruption will be possible due to construction traffic. A slight negative but temporary residual effect on the local economy is therefore identified during the construction phase of the proposed scheme.

The steps/slipway along River Walk will be demolished during the construction period to facilitate WP4. A moderate negative, but temporary residual effect on amenity is therefore identified at this location. A pontoon will be installed at this location during the operational phase of the proposed scheme.

Existing floating moorings and berths at the pontoon at North quay will be required to be relocated during the construction phase. A significant negative but temporary effect on boat users currently using these facilities is therefore identified.

The construction phase of the proposed scheme is expected to have a residual significant negative but temporary effect (North Quay slip), residual slight negative and permanent effect (Coal Quay slip), residual moderate negative and permanent effect (public slip at Tyrells Yard).

Given that access to the existing slipway and set-down pontoon at Arklow Harbour/Dock will be maintained during the summer months (June-August), a residual moderate negative but temporary effect on river access for amenity purposes is identified at the public slip/ ‘set-down’ pontoon at Arklow Dock.

There will be moderate-significant negative residual effects on tourism and amenity during the construction phase of the proposed scheme, due the physical presence of construction works and associated restrictions to amenity areas and river access locations, as well as restricted use of the river during WP2. Access to the harbour will be maintained throughout the construction period.

During the construction phase of the proposed scheme, the physical presence of construction works along River Walk and South Quay will reduce the amenity and community use of these areas.

During the construction phase of the proposed scheme, the physical presence of construction works along River Walk and South Quay will reduce the amenity and community use of the following land-parcels.

- Land along River Walk and South Quay- which are used for amenity purposes[3]
- Site Compounds 2 and 6 (Land Parcels No. 127 and 125 respectively)- which are currently open green space and used for amenity purposes.

A temporary, significant negative residual effect on amenity and community-use is therefore identified during the construction phase of the proposed scheme at the above land-parcels.

Permanent loss of amenity/community use has been identified at the following land parcels commencing in the construction phase of the proposed development:

- Land Parcel No. 100- Presbyterian Church/Arklow Marsh.

While the earth embankment will not encroach on the land parcel itself, the land-parcel will be permanently acquired by WCC. For the purposes of this assessment, a permanent significant negative effect on amenity and community use at this location is therefore identified during the construction phase.

In the long term, in the operational phase, the reduction in flood risk and investment in the public realm will provide a significant positive effect. The proposed Arklow Flood Relief Scheme will significantly reduce the risk of flooding in the area. This will provide significant economic benefits in terms of avoided flood damage to residences, businesses, utilities and movement and social benefits too in terms of personal movement, safety and health.

Impacts identified in **Chapter 2**, *Background and Need* of the EIAR that are of particular relevance from a socio-economic perspective include the avoidance of damage to, or functional loss of, buildings and property, damage or disruption to infrastructure and utilities, loss of earnings, loss of retail or commercial income, travel inconvenience and associated costs, and potentially the avoidance of the temporary evacuation of residents.

Likewise, the flood protection measures will reduce the risk of flood damage to tourism amenities in the area such as shops, cafes, restaurants, hotels and guesthouses. This includes the subsequent cost of clean-up and repair operations.

There will also be benefits for residents and businesses from improved access to affordable commercial buildings and property insurance.

As a result, the scheme will have a long-term significant positive impact both for residents, local amenities, tourism and economic activities. The increased flood protection will contribute to securing businesses and jobs in the area. Existing properties will benefit from the greater flood protection and this will also contribute towards attracting additional investment and jobs to the area as properties become more attractive to rent or buy. Areas that might previously have been subject to flood risk or consequent development restrictions will potentially be available for new development and investment.

[3] Land Parcels (Refer to Appendix 17.1): 114a, 114b, 114c, 118a, 118 b, 119a, 119c, 119d, 119e, 120a, 120b, 120c, 120d, 120 e, 120f, 120g, 120h, 120j, 120k, 120l, 120m, 120n, 121a, 124a, 124b, 124c

The overall impact of the scheme on the local amenity value will be significantly positive and permanent with flood defence measures designed to protect local amenities such as shops and restaurants. The improved public realm along River Walk and South Quay will also result in a significant positive effect on local amenity through the creation of a more accessible and attractive public realm.

A new pontoon will be installed at River Walk as part of the proposed scheme, resulting in a positive effect on amenity at this location. The operational phase of the proposed scheme is however expected to have a residual slight negative effect (Coal Quay slip), residual significant negative effect (public slip at Dock) and residual moderate negative effect (public slip at Tyrells Yard) on river access for amenity purposes.

The key benefit of the proposed flood relief scheme will be to provide much needed flood protection to existing homes and businesses in Arklow town. This positive benefit will also extend to future developments and new infrastructure in Arklow town. While it is acknowledged that, following construction of the proposed scheme, access to the Avoca River may be restricted at the locations outline above, any removal or restriction of access to the river was considered integral to the design and implementation of the flood relief scheme.

The Avoca river will be significantly improved from a navigational point of view, following the dredging of the same.

Permanent loss of amenity/community use has been identified at the following land parcels commencing in the construction phase of the proposed development:

- Land Parcel No. 100- Presbyterian Church/Arklow Marsh.

While the earth embankment will not encroach on the land parcel itself, the land-parcel will be permanently acquired by WCC. For the purposes of this assessment, a permanent significant negative residual effect on amenity and community use at this location is therefore identified during the operational phase.

No adverse effect during the construction phase on human health is predicted. Significant positive impacts in terms of public health and socio-economic benefits with resultant benefits for human health are predicted on the basis of having an effective flood relief scheme.

21.3.11 Material Assets

Land and Property Ownership

As outlined in **Chapter 17** *Material Assets* of the EIAR, land acquisition will occur in advance of the construction phase of the proposed scheme. As land-take will be permanent, all likely effects identified in **Appendix 17.1** of the EIAR are residual effects.

Appendix 17.1 of the EIAR includes an assessment of the likely significant effects on land and property ownership during both the construction and operational phase of the proposed scheme. Where land is acquired from private

landowners, moderate negative effects on property ownership are identified. Access to all existing residential properties, will be maintained at all times during the construction of the proposed development. This may require temporary alternate access arrangements at some locations.

The proposed scheme also involves the removal of a material asset- the existing above-ground piping from the former IFI site now owned by Crag Digital Avoca Ltd (Echelon Data Centres). The section of pipeline within the FRS planning boundary will be removed and will be disposed of at a licenced waste facility. Removal of the pipes will occur during the construction phase but will not be reinstated prior to operation. A permanent but significant negative effect on this material asset is therefore identified.

The steps/slipway along River Walk will be demolished during the construction period to facilitate WP4. A moderate negative, but temporary residual effect on this material asset is therefore identified. The steps/slipway at this location will be replaced by a new pontoon in the operational phase.

During WP2 (Q2-Q3 2026), the pontoon located in the North Quay side of the Avoca River, will effectively be rendered inaccessible from the water as dredging will be ongoing during this period. Any boats using the existing berths at the pontoon will be required to relocate in order to facilitate the river dredging. Similarly, the existing floating mooring facilities within the Avoca River will be removed to facilitate the dredge works and any boats using these will also be required to relocate for the duration of the river dredging. A negative residual effect on both the mooring facilities and the berths is therefore identified during construction.

However, as the berths and moorings will only be rendered inaccessible during the river dredging works, (Q2-Q3 2026), these effects are considered to be slight negative and temporary in nature. All mooring and berth facilities will be reinstated following completion of construction.

The proposed bridge underpinning works (WP1), river dredging (WP2), as well as the construction of the flood defence walls along South Quay (WP4) will render the existing Coal Quay slip permanently inaccessible, from the commencement of works (Q1 2023) until the slip is eventually demolished as part of WP4. However, it should be noted that this slip is currently in disrepair and is not extensively used by the public. A permanent slight, negative significant residual effect on this material asset is therefore identified.

The existing slipway at North Quay will be used to facilitate RA3 during WP2 and, as such, will be rendered inaccessible for the duration of those works (May-September in-river works 2026)). A temporary, significant negative residual effect on this material asset is therefore identified during WP2 of the construction phase.

The proposed river dredging, as well as the construction of the flood defence walls along South Quay will also render the existing Tyrells Yard slip permanently inaccessible, from the commencement of the South Quay element of WP 4 (Q2 2025). It should be noted however that currently, access to the river via this slipway is not continuously maintained due to the demountable barrier currently in place. Nevertheless, a permanent moderate, negative significant

residual effect on this material asset is therefore identified as a result of the loss of this river access.

The existing public slipway at Arklow Harbour/Dock will be inaccessible for a temporary period during the construction of the flood defence walls (WP4). Similarly, the 'set-down' pontoon at Arklow Harbour will be rendered inaccessible from the land at this time. River access will likely only be unavailable at these locations for the short period in which the flood walls are being constructed at Arklow Harbour/Dock and not for the entire duration of WP4, or indeed for the full timeframe for the South Quay element of the work between Q2 2025-Q1 2026. A significant negative, but temporary residual effect on this material asset is therefore identified during the construction phase of the proposed scheme. It is proposed that closure of the existing slipway and set-down pontoon at Arklow Harbour/Dock be avoided during the summer months (Jun-Aug). When temporarily inaccessible, the slipway at North Quay will be available for use depending on its suitability for users.

Land acquisition will occur in advance of the construction phase of the proposed scheme and remain in place throughout operation. As land-take will be permanent, all likely effects identified in **Appendix 17.1** of the EIAR are residual effects.

During the operational phase of the proposed scheme, access to, and use of the pontoon along the North Quay, as well as the floating moorings in the river, will be re-instated and the river dredging will give rise to an improved estuarine environment for moorings, in the operational phase. The existing slipway at North Quay will be reinstated in the operational phase of the proposed scheme.

The Coal Quay slipway will be removed. However, it should be noted that this slip is currently in disrepair and is not extensively used by the public. A permanent slight, negative significant residual effect on this material asset is therefore identified.

The existing slipway at South Quay (Tyrells Yard) while maintained during the operational phase, will be rendered inaccessible. It should be noted however that currently, access to the river via this slipway is not fully maintained due to the demountable barrier currently in place at this location. As such, a permanent moderate negative residual effect on this material asset is identified.

The existing slipway at Arklow Harbour is to be maintained during the operational phase of the proposed scheme. However, a demountable flood defence is to be installed at this location. Access arrangements will be put in place to allow interested parties to gain access to the slipway during operation, as required. The existing pedestrian access to the 'set-down' pontoon at Arklow Harbour will also be restricted. A permanent slight negative residual effect on these material assets are therefore identified.

At River Walk, a new floating pontoon will replace the demolished steps/slipway, resulting in a positive effect on amenity at this location.

The proposed scheme will provide protection from the 1% AEP fluvial flood event and the 0.5% coastal flood event. This will result in very significant positive

impacts in a number of areas such as tangible and intangible flood damages, financial loss, extensive community disruption, health and safety issues and development restrictions as described below. Damages due to flooding include direct damages to residential and non-residential properties, commercial buildings, agricultural lands, damage to infrastructure and utility assets and the cost of emergency services will be avoided for all flood events up to the design event.

Electricity and Lighting

As previously outlined, the proposed scheme will interact with the overhead electricity cables along River Walk and South Quay and as such, these will be relocated or diverted underground as part of the enabling works for WP1 and WP4 and remain in place throughout operation. The ESB Overhead cables which are located within Arklow Town Marsh will be repositioned during the enabling works of WP5 to avoid the flood embankment. Overhead services which branch off the main line will be diverted underground.

All diversions will occur during the construction phase but remain in place throughout operation. A permanent, but not-significant residual construction phase effect on electricity infrastructure is therefore identified.

There may be some temporary disruption to services during the construction phase of the proposed scheme. However, these will be planned and communicated to the public in advance and carried out in accordance with the relevant codes of practice.

The existing decorative and bridge lighting will be removed along River Walk and South Quay during construction. A slight-negative residual effect on lighting features is therefore identified during construction. Temporary construction lighting will be provided.

All diversions will occur during the construction phase but remain in place throughout operation. A permanent, but not-significant residual operational effect on electricity infrastructure is therefore identified.

Lighting that is removed during the construction phase will be reinstated during operation. No residual effects on electricity or lighting are therefore anticipated during the operational phase of the proposed scheme.

Telecommunications

Following implementation of the mitigation measures, no residual effects are anticipated to occur during the construction phase of the proposed scheme.

No residual effects on telecommunications during the operational phase of the proposed scheme are anticipated.

Gas

Following implementation of the mitigation measures, no residual effects are anticipated to occur during the construction phase of the proposed scheme.

No residual effects on gas infrastructure during the operational phase of the proposed scheme are anticipated.

Water Supply Infrastructure

Following implementation of the mitigation measures, no residual effects are anticipated to occur during the construction phase of the proposed scheme.

No residual effects on water supply infrastructure during the operational phase of the proposed scheme are anticipated.

Sewer Network and Drainage Infrastructure

Following implementation of the mitigation measures, no residual effects are anticipated to occur during the construction phase of the proposed scheme.

No residual effects on the sewer network and drainage infrastructure during the operational phase of the proposed scheme are anticipated.

Additional Material Assets

The existing drainage channel in Arklow Town Marsh will be diverted to the east of the proposed embankment. This diversion will occur during the construction phase but remain in place throughout operation. A permanent, but not-significant effect on material assets is therefore identified

21.3.12 Major Accidents and Disasters

The risk of a major accident and/or disaster occurring during either the construction or operational phases of the proposed development is considered low.

21.3.13 Climate

In relation to climate, over the lifespan of the proposed development, no significant effects are predicted.

21.4 References

CIRIA (2015) *Environmental Good Practice on Site Guide, 4th Edition*

DoEHLG (2006) *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects.*

European Communities (2001) *European Communities (Noise Emission by Equipment for Use Outdoors) Regulations, 2001*

Irish Water (2018) Arklow Wastewater Treatment Plant Project. https://www.water.ie/planning-sites/arklow-wastewater/docs/environmental-documents/volume-2/Arklow%20WWTP%20EIA%20-%20Chapter%2010%20Noise%20Vibration.pdf

Appendix B of CEMP

Invasive Alien Plant Species Management Plan

Wicklow County Council and the Office of Public Works

Arklow Flood Relief Scheme

Invasive Alien Plant Species Management Plan

Ref/1

Issue | 20 April 2021

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Contents

Appendices

1 Introduction

Invasive alien plant species (IAPS) have been identified and documented within the proposed works areas relative to the Arklow Flood Relief Scheme ('the proposed scheme'). The purpose of this IAPS management plan is to present the strategy that will be adopted during the construction and operation of the proposed scheme in order to manage and prevent the spread of the IAPS.

Construction (and potentially operational maintenance works) could potentially disturb stands of invasive plants and/or soils contaminated with invasive plant material. In addition to lands within the proposed works areas, there is an identified risk of invasive plant species being spread onto neighbouring lands and onto public roads and other locations.

This plan is intended to be a working document and will be finalised by the Contractor following appointment and prior to commencing works on site. All of the content provided in this Plan will be delivered in full by the Contractor and its finalisation by the Contractor will not affect the robustness and adequacy of the information presented here and relied upon in the EIAR and NIS.

Following construction, the plan will be updated for the operational phase, taking into account the results of the detailed construction IAPS management plan and operational maintenance requirements etc.

Invasive plant species which have been identified in the proposed works areas include Butterfly-bush (*Buddleia davidii*), and Rhododendron (*Rhododendron ponticum*). Outside of the planning boundary along the Avoca River, Himalayan balsam (*Impatiens glandulifera*) and Japanese Knotweed (*Fallopia japonica*) have both been previously recorded.

This report outlines the strategy that will be adopted during the construction and operation of the proposed scheme in order to prevent the spread of IAPS.

The main objective of the invasive species management strategy for the scheme will be to:

- Prevent the spread of IAPS during the construction phase including advance works (such as site investigations, utility diversions etc);
- Manage the growth of IAPS adjacent to flood defences to protect the integrity of the structures from the impacts of these species;
- Prevent the spread of IAPS during channel maintenance works in the future.

2 Methodology

This plan and the management strategies relating to each IAPS have been prepared with regard to the following guidance documents, where relevant:

- The Management of Invasive Alien Plant Species on National Roads – Standard (Transport Infrastructure Ireland, 2020);
- The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (Transport Infrastructure Ireland, 2020); and
- Transport Infrastructure Ireland (incorporating the National Roads Authority, Revision 1, December 2010). Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Road Schemes.

Field surveys were carried out for the Arklow FRS as detailed in **Section 3** below. The desk studies carried out to inform this plan accessed information held by the NBDC database http://maps.biodiversityireland.ie. The Arklow Wastewater Treatment Plan EIAR[1] was also reviewed.

[1] Arklow Wastewater Treatment Plant Project Environmental Impact Assessment Report (Arup, 2018a) and Natura Impact Statement (Arup, 2018b) are available at https://www.water.ie/planning-sites/arklow-wastewater/environmental-documents/

3 Results of Previous Surveys

A series of walkover habitat surveys were carried out for the Arklow FRS development during 2019 and 2020. Earlier surveys between 2016-2018 were also undertaken. Refer to **Chapter 10** *Biodiversity* of the EIAR for further details of the specific locations of IAPS identified during surveys. The habitat and invasive species survey mapping produced for **Chapter 10** is reproduced below in **Appendix A**. The walk-over surveys also included checks for the presence of IAPS listed in Part 1 of the Third Schedule[2]. Additional species listed as IAPS in the 2000 TII Guidance were also recorded, together with non-native species encountered that can be spread through distribution of plant material.

IAPS have been identified and documented within, and in close proximity to, the proposed scheme boundary.

Within the planning boundary two species of invasive plants were recorded during walk-over surveys.

The species are Butterfly-bush (*Buddleia davidii*) and Rhododendron (*Rhododendron ponticum*). Butterfly-bush was recorded at Site Compound 1 (Arklow marsh) and Site Compound 3 (Ferrybank). Rhododendron was also recorded at Site Compound 1.

An extensive stand of Rhododendron was recorded in the eastern part of the Arklow marsh pNHA and overlaps the planning boundary. This area coincides with the proposed flood defence embankment area.

Rhododendron ponticum is invasive in Ireland. It can spread via seed or can also occur by vegetative means, where plants sucker or throw up new sprouts from roots as well as branches. It can withstand considerable shade and thrives as an understorey species in woodland, though it also tolerates open conditions in suitable acid soils. Its dense tangle of stems can block pathways, smother watercourses and encroach on roadways thereby impinging on sight-lines. The foliage of rhododendron contains various compounds that appear to have an allelopathic action on other species (inhibiting their growth) which may further inhibit plants from growing within close proximity.

Buddleia davidii is another invasive species to Ireland. Buddleia produces very large numbers of viable seeds, which are dispersed via wind and water. The seeds are relatively short-lived in the soil, rarely lasting longer than four years. The plant can also readily spread by producing roots, and ultimately new plants, where stem nodes come into contact with the ground. It can also spread by fragmentation of stems or roots. It is very fast growing and can reach 2m in its first year, producing flowers and setting seed. It colonises bare ground very rapidly and can quickly form mono-typic stands. As buddleia tolerates very poor soils, it can grow on walls, rock outcrops or sub-soils.

[2] Part 1 of the Third Schedule, European Communities (EC) (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011)

Outside of the planning boundary Himalayan balsam (*Impatiens glandulifera*) was recorded at three locations along the north bank of the Avoca River upstream of the FRS planning boundary. These areas are located approximately 500m, 800m and 900m north west of the Arklow FRS planning boundary.

Japanese Knotweed (*Fallopia japonica*) and Buddleia were recorded along the River Walk area outside of the FRS planning boundary area.

Refer to **Chapter 10** *Biodiversity* of the EIAR for further details.

4 Management of Invasive Alien Plant Species

4.1 Introduction

The invasive alien plant species identified within the planning boundary can easily spread to new areas. Other species identified outside the planning boundary can also spread to new areas depending on the right conditions. Most are particularly effective at colonising disturbed ground (e.g. construction sites). The most common ways that invasive alien plant species can be spread are:

- Site and vegetation clearance, mowing, hedge-cutting or other landscaping activities
- Spread of seeds or plant fragments during the movement or transport of soil
- Spread of seeds or plant fragments through the local surface water and drainage network
- Contamination of vehicles or equipment with seeds or plant fragments which are then transported to other areas
- Importation of soil from off-site sources contaminated with invasive species plant material

As noted in **Chapter 5** *Construction Strategy* of the EIAR, it is expected that the proposed scheme will be delivered through five Work Packages (WP). Subject to obtaining planning approval, the construction duration of the proposed scheme is expected to take place throughout the planning boundary over several years. Whilst the planning boundary for the proposed scheme covers the area required for all WP, the works areas and site compounds within the planning boundary will differ depending on the individual WP.

The main aspects of this plan are set out as follows:

- Preconstruction Survey
- Update IAPS management plan with specific details on proposed treatment for each of the works areas and site compounds
- Advance Treatment
- Suggested Treatment Methods
- Site Hygiene and Biosecurity Measures

The Contractor, when appointed, will ultimately be responsible for sequencing and implementation of IAPS treatment for each of the WP. All of the content provided in this Plan will be delivered in full by the Contractor and its finalisation by the Contractor will not affect the robustness and adequacy of the information presented here and relied upon in the EIAR and NIS.

Depending on the final timescale for the various work packages for construction of the proposed scheme, it may be possible to eradicate some species prior to the onset of construction on the site via an advance treatment contract for either all WP or individual WP (Refer to **Section 4.4** below). However, if control programmes have not been achieved before construction begins, then site hygiene measures will need to be put in place to ensure that the further spread of IAPS is avoided. Refer to the **Section 4.6** below on-site hygiene for further details on same.

Following construction, the plan will be updated for the operational phase, taking into account the results of the detailed construction IAPS management plan and operational maintenance requirements etc.

4.2 Pre-construction Survey

Prior to commencement of construction, all of the areas within the planning boundary will be re-surveyed for IAPS to ensure that new infestations have not been established in the interim period between the previous surveys and construction stage.

A suitably qualified ecologist or horticulturalist, capable of identifying the relevant IAPS and protected or rare habitats and species that could be affected through the management of IAPS, shall be appointed to carry out a pre-construction site assessment for the presence of IAPS. This person shall also provide advice on the control options, timing of treatments and related matters. The assessment will further take account of the presence and location of any planting or landscaping within the planning boundary, as well as any sensitive ecological receptors (such as the Avoca River and Arklow Marsh pNHA) that may be in the immediate vicinity. Consideration will also need to be given to whether there is potential bird nesting habitat in the vicinity where control is being undertaken during the bird nesting season (1st March to 31st August).

During habitat mapping, the perimeter of each IAPS infestation shall be surveyed using a recognised topographical survey technique by a suitably qualified person. Infestations shall be suitably mapped for inclusion in a GIS system.

The results of the pre-construction survey will confirm the management strategy for treating the invasive alien plant species within the FRS planning boundary.

4.3 IAPS Management Planning

The results of the previous surveys have indicated that Butterfly-bush (*Buddleia davidii*) and Rhododendron (*Rhododendron ponticum)* are located within the planning boundary. These species will require treatment as part of the IAPS management plan. Treatment options for these species are described below.

The results of the pre-construction survey will confirm the management strategy for treating the IAPS within the FRS planning boundary.

Treatment options of other invasive alien species may also need to be considered should new infestations become established in the interim period between the previous surveys and construction stage.

In addition to the advance treatment works and pre-construction survey, when the site becomes available to the Contractor for fencing and commencement of site clearance, areas identified as requiring specific treatment will be demarcated and the designated control measures implemented at the earliest possible stage to reduce the risk of spread along the proposed road development or beyond the land take.

There are several management options that may be implemented to control and prevent the spread of IAPS. These are presented in the sections below. It is also noted that it may not be possible to completely eradicate the IAPS before or during the construction phase.

Regard shall be given to the guidance provided in Section 2 above as part of the management planning. In particular, the Management of Invasive Alien Plant Species on National Roads – Technical Guidance (Transport Infrastructure Ireland, 2020) provides useful information on the law regulating the management of IAPS and the protection of water quality, birds and habitats. The Contractor shall ensure that all legislation (such as Wildlife Act 1976, as amended, European Communities (Birds and Natural Habitats Regulations, 2011 etc) is complied with as part of the management planning.

Care shall be taken to choose the most appropriate control method for the specific circumstances of each site. Chemical control of IAPS may risk damaging adjacent rare or protected flora and fauna in sites of special conservation interest (such as Arklow Marsh pNHA) or in adjacent waterbodies (such as Avoca River).

In the case of sensitive ecological areas such as the Arklow Marsh pNHA and the Avoca river, Wicklow County Council will consult with the local NPWS Ranger in advance of undertaking any controls in such areas to ensure water quality, fauna and habitats are protected during the treatment process.

Raw materials (e.g. topsoil, sands and gravel) may be imported from a range of locations. It is important that all such locations, (e.g. quarries, gravel pits, or other areas) are assessed for the presence of IAPS in advance of removing any material from such sites.

At sites where IAPS that reproduce solely using seeds are known to be present, priority shall be given to reducing the risk of seed transfer by preventing the plants from flowering.

In relation to all IAPS, efforts shall be made to reduce the risk of material transfer by instigating appropriate controls on the movement of machinery and soil/gravel/stones in the infected area, i.e. by implementing strict and appropriate biosecurity measures on site.

Biosecurity essentially refers to the measures to be taken to prevent the introduction and spread of IAS; refer to TII technical guidance[3].

A systematic approach shall be taken in the removal and control of IAPS, ensuring that the use of tracked machinery is limited in infested areas and vehicles and equipment are cleaned before moving between sites. This will minimize the risk of introducing or reintroducing contaminated soil/gravel/stones, seeds or plant fragments into areas that is already treated or developed.

The management strategy for IAPS presented in the TII technical guidance[4] document (GE-ENV-01104) provides the template for strategic management, which shall commence with an assessment of the detailed distribution of all IAPS within the lands in question. Following this, the approach to control and preventing the further spread of the plant can be elaborated depending on the following:

- The scale and extent of infestation (including whether confined to the FRS footprint or not)
- The IAPS present
- The sensitivity of the local environment, e.g. presence of Natura 2000 sites or natural heritage areas
- The growth stage/season of the plants

The type of treatment chosen will depend on site conditions (such as proximity to a watercourse/surrounding habitats/ proximity to residential dwellings, health and safety and traffic concerns) and the type and extent of infestation. For example, chemical stem injection alone is not a feasible treatment method for dealing with large extensive areas of infestations and excavation alone is not a feasible treatment method for dealing with large scale infestations on riverbanks. Rather a combined method of different treatments will be chosen on a site by site basis and with regard to sensitive receptors in immediate environs.

The decision to use a particular type of treatment in the control of specific IAPS shall be made on a case-by-case basis by the Ecologist or Horticulturalist, in consultation with the Registered Pesticide Advisor and Registered Professional User as appropriate. Control of IAPS can be divided into either physical or chemical methods. Whilst there should generally be a preference for physical control methods, chemical control may, in some instances, be more appropriate. In other instances, a combination of treatment by herbicide and physical methods may be most appropriate.

[3] TII guidance The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (Transport Infrastructure Ireland, 2020).
[4] TII guidance The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (Transport Infrastructure Ireland, 2020).

4.4 Advance Treatment

An advance works contract may be implemented if appropriate to commence treatment of some non-native invasive species in some areas within the planning boundary before construction starts. By treating in advance, it may be possible to contain the spread of the infestation. The implementation of advance treatment may require permission from landowners to access and treat the infested areas. However, it may not be possible to gain permission to access all the affected areas in sufficient time in advance of the construction stage to carryout treatment.

As part of the advance works contract, the Contractor will be required to update and implement the recommendations of this management plan prior to advance treatment commencing. The purpose of the advance treatment plan will be to:

- Identify the extent of the infestation on the site
- Ensure further growth and spread of the plant on the site does not occur
- Ensure the plant is not spread to other sites either adjacent to the infested site or through transportation of contaminated soil to another site
- Identify the best method for managing and controlling the non-native invasive plant species on the site with regard to the future proposed site works and construction methods
- Communicate the plan to all site operatives to ensure success of the plan
- Document and record the treatment and management methods carried out on site for future reference (for use during main construction contract, future site owners, site users, avoid litigation etc.)

The advance treatment plan shall be completed by a qualified ecologist, made as simple as possible and will include the following:

- Site background including proposed works
- Extent of the current known locations of non-native invasive species infestations including detailed mapping showing same locations
- Site survey at known locations of infestations
- Following on from site survey and based on recommendations from this outline IAPS management plan, confirm specific advance treatment to be put in place
- Site hygiene protocols during advance treatment
- Responsible individuals
- Contact details of landowners
- Follow up requirements
- Any other relevant information deemed necessary by the ecologist
- Close out report documenting details of advance treatment carried out and any recommendations to be carried out during main construction phase

4.5 Treatment Methods

The results of the pre-construction survey will confirm the management strategy for treating the invasive alien plant species within the FRS planning boundary.

The decision to use a particular type of treatment in the control of specific IAPS shall be made on a case-by-case basis by the Ecologist or Horticulturalist, in consultation with the Registered Pesticide Advisor and Registered Professional User as appropriate. Control of IAPS can be divided into either physical or chemical methods. Whilst there should generally be a preference for physical control methods, chemical control may, in some instances, be more appropriate. In other instances, a combination of treatment by herbicide and physical methods may be most appropriate. Control options for Butterfly-bush (*Buddleia davidii*) and Rhododendron (*Rhododendron ponticum)* are presented below. The details of treatment options are based on the information provided in the TII guidance *The Management of Invasive Alien Plant Species on National Roads – Technical Guidance* (Transport Infrastructure Ireland, 2020).

4.5.1 Butterfly bush (*Buddleia davidii*)

Butterfly-bush was recorded at Site Compound 1 (Arklow marsh) and Site Compound 3 (Ferrybank). Both compounds will be required for various work packages at different times (Refer to **Chapter 5** *Construction Strategy* of the EIAR, for specific details on the usage of site compounds for each of the work packages.

It is recommended that a suitably qualified ecologist or horticulturalist with sufficient training, experience, and knowledge in the control of IAPS should be employed to assist in the planning and execution of control measures in relation to Buddleia. In addition, those involved in the control of Buddleia may be advised to obtain the advice of a Registered Pesticide Advisor on the register established by the Minister for Agriculture, Food and the Marine pursuant to Regulation 4 of the Sustainable Use of Pesticides Regulations. All pesticide users must be registered and have the appropriate training necessary to carry out the proposed method of control.

As Buddleia is a plant that favours disturbed sites, physical removal of plants can provide ideal conditions for the germination of seeds that are present in the soil. For this reason, care needs to be taken to ensure that revegetation of treated areas is undertaken swiftly. The branches of Buddleia are capable of rooting as cuttings, so care shall also be taken to ensure material is disposed of in a manner to avoid this risk.

Foliar application of herbicide control young plants and small infestations but should be followed up at six-monthly intervals as regrowth is common. At the infestation is located within/adjacent to the Arklow Marsh pNHA, particular care will need to be taken in the management planning of this IAPS to protect the adjacent habitats and fauna in the pNHA.

Removal of the flower heads before seed set (June or even July) is an important control method as it reduces the volume of seeds that are available to spread.

Hand-picking of young plants will provide control but it is very tedious and should be undertaken with care to avoid soil disturbance, which can give rise to a flush of new seedling.

Digging out plants is only practical with relatively minor infestations, at the initial stage of invasion, or where a site is to be excavated for development or road construction purposes. Mowing of young plants does not provide effective control as they re-sprout with vigour. The physical removal of mature stands is not recommended for the same reason. After uprooting, it is essential to plant the ground to prevent a flush of new seedling growth.

When Buddleia plants are cut, regrowth from the stump can be very vigorous.

Effective control can be achieved by cutting Buddleia plants to a basal stump during active growth (late spring to early summer) and immediately treating the total cut surface with herbicide concentrate. Monitoring will be required and retreatment, as necessary.

It is recommended not to leave cut stems and branches on the ground as they will reroot and produce new plants.

4.5.2 Rhododendron (*Rhododendron ponticum*)

An extensive stand of Rhododendron was recorded in the eastern part of the Arklow marsh pNHA and overlaps the planning boundary. This area coincides with the proposed flood defence embankment area which will be constructed during WP5. (Refer to **Chapter 5** *Construction Strategy* of the EIAR, for specific details on the construction methodology and timescale for WP5. A stand of Rhododendron was also recorded along the northern boundary of SC1 near the Dublin Road

It is recommended that a suitably qualified ecologist or horticulturalist with sufficient training, experience, and knowledge in the control of IAPS shall be employed to assist in the planning and execution of control measures in relation to Rhododendron. In addition, those involved in the control of Rhododendron may be advised obtain the advice of a Registered Pesticide Advisor on the register established by the Minister for Agriculture, Food and the Marine pursuant to Regulation 4 of the Sustainable Use of Pesticides Regulations. All pesticide users must be registered and have the appropriate training necessary to carry out the proposed method of control.

At the infestation is located within/adjacent to the Arklow Marsh pNHA, particular care will need to be taken in the management planning of this IAPS to protect the adjacent habitats and fauna in the pNHA.

Considerable effort has been focused on the control of Rhododendron, particularly in woodland habitats, in Ireland and elsewhere in the northern hemisphere. The choice of control method can influence the recovery of the site and shall be considered prior to undertaking any control operation. Rhododendron grows vigorously when cut and the tiny seeds may be unintentionally spread by machinery, on clothes, boots, or other PPE.

Hence, biosecurity measures must be put in place to prevent further spread of the plant when undertaking any control works. Regular follow-up is required to deal with re-growth and seedling germination, irrespective of the control method employed.

When dealing with large Rhododendron infestations, foliar spraying with herbicides is not recommended. This reflects the fact that considerable quantities of herbicide will be required, which can have effects on understorey flora beneath the target species and cause significant drift that will impact other non-target species. However, if access to the base of the main stems is possible, herbicide may be applied directly to the stem. Stem injection is another option for chemical control that involves herbicide application directly into the stems of large plants. This method enables a more precise application of the herbicide. Holes > 3cm diameter shall be drilled into the stem and herbicide applied immediately. Herbicides shall be applied during periods of active growth, i.e. late spring or summer.

A range of physical control measures have been developed for Rhododendron in response to the general sensitivity of acid woodland (and other) sites where it is frequently established (collateral damage by chemical spray drift on non-target species is a prime concern in such sites). Manual pulling of plants that are less than 20cm high is successful once all of the roots are removed. The pulled material shall be bagged for removal from site. It is also an option to flail and or mulch young material, and to leave the mulch on site. As there will be no seeds present (the plant does not seed until it is 10–12 years old), it is possible to leave this material on site.

Cutting of large stems is another physical control option; however, the plant's capacity for regeneration from suckers that emerge from roots or stems that remain in the ground renders this method relatively ineffective unless applied in areas of limited infestation, where adequate follow-up can be made. This approach can also be very labour-intensive and expensive.

It is possible to mechanically uproot mature Rhododendron plants due to the shallow nature of the root system. However, this is generally only appropriate for sites where access to machinery is possible and at sites of low ecological interest where damage to existing native vegetation is not a concern. Where chemical control of cut stumps and rootstocks is not an option, stump extraction will be necessary. This will normally involve using machinery, where access is possible.

Heavy trafficking of woodland soils can result in puddling of soils, giving rise to sediment run-off and nutrient leaching which can impact on watercourses.

With isolated plants (> 1m tall) or small infestations, effective control can be achieved by cutting the plant to the stump and immediately treating the latter with herbicide. The use of an inert dye mixed with the herbicide will ensure that no stumps are missed. Another option is to cut the stem and treat the tender regrowth with herbicide. For plants with a stem diameter less than 2cm, the stem can be broken at the base ensuring that it is not fully severed, and a concentrated solution of herbicide immediately applied.

For plants greater than 2cm in diameter, notches can be cut in the stem using a hatched or saw (referred to as feathering) and a concentrated solution of herbicide immediately applied. It is important to apply shallow cuts so that the herbicide has access to the plant's transport system, which is just inside the bark.

This type of treatment is effective all year-round, although it is deemed to be most effective when conducted between November and April.

Regular follow-up is required to deal with re-growth and seedling germination, irrespective of the control method employed.

Any cut material will need to be removed from the site to avoid resprouting or suckering, which will produce new plants and potential infestations. Mulching is a good option for disposal and the mulch may be left on site, if no seeds are present.

4.5.3 Treatment Monitoring

Those responsible for the treatment of IAPS must document the methods of treatment employed. This documentation must be completed every time a treatment operation is performed. All herbicide treatment monitoring observations must be recorded by the Contractor in a suitable format. An example of a recording sheet is provided in the TII guidance[5].

All treatment data must be submitted to Wicklow County Council in an Esri or equivalent GIS file compliant point dataset of IAPS recorded.

In the case of sensitive ecological areas such as the Arklow Marsh pNHA and the Avoca river, Wicklow County Council, will consult with the local NPWS Ranger in advance of undertaking any controls in such areas to ensure water quality, fauna and habitats are protected during the treatment process.

Following control of large areas of IAPS, subsequent disturbance of the soil may give rise to a flush of seedling germination or revitalised rhizome growth. To avoid this, bare soil shall be mulched (covered with a natural or synthetic barrier, such as wood chip, straw, geo-textile, or other appropriate material) and planted at the earliest opportunity with appropriate native replacement vegetation to stabilize the soil and deter subsequent re-invasion.

In some cases, it may not be possible to control an established stand of IAPS with a single herbicide treatment. Therefore, repeated treatments over successive years may be necessary. Where physical methods are used to control IAPS, the treated area will also need to be monitored over several years for regrowth. A site may be considered remediated after two consecutive growing seasons with no sign of regrowth from all the previously identified stands. However, there is always the possibility of further regrowth occurring, either through re-infestation of the site from off-site, or the reactivation of dormant rhizomes due to disturbance of soils.

It is important that any regrowth of treated IAPS on a site is accurately mapped and detailed reports prepared and submitted to the Client.

[5] TII guidance The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (Transport Infrastructure Ireland, 2020).

Monitoring must be conducted for several years post-treatment in order to determine the level of control success that the treatment(s) has achieved. The regrowth monitoring survey observations must be recorded in a suitable format. An example of a recording sheet for regrowth monitoring is provided in the TII guidance[6]. All treatment data must be submitted to Wicklow County Council in an Esri or equivalent GIS file compliant point dataset of IAPS recorded.

Where possible infested material will remain on site and be re-used. Any infested material that must be removed off site to landfill or other suitable facility will require a licence from the NPWS.

4.6 Site Hygiene and Biosecurity Measures

Maintaining site hygiene at all times in an area where invasive alien plant species are present is essential to prevent further spread. It is also necessary on sites where invasive alien plant species are not present but where there is risk of contaminated material being brought to site, for example, site machinery being used on multiple sites, construction staff travelling between infested and not infested sites. Preventative measures must be taken. Construction equipment, vehicles and footwear may provide a vector for the spread of non-native invasive species.

The following site hygiene measures shall be taken for each area and work package where applicable:

- Fence off the infested areas prior to and during construction works where possible to avoid spreading seeds or plant fragments around or off the construction site;
- Clearly identify and mark out infested areas. Erect signs to inform Contractors of the risk;
- Avoid, if possible, using machinery with tracks in infested areas;
- Clearly identify and mark out areas where infested soil is to be stockpiled on site and cannot be within 50m of any watercourse or within a flood zone (i.e. Avoca River and canal within Arklow Marsh);
- Create designated entry and exit points for operators on foot and for small mobile equipment. A delineated access track to be maintained free of non-native invasive species to be established through the site to avoid the spread of invasive plant species by permitted vehicles accessing the site;
- Installation of a dedicated footwear and vehicular wheel wash down facility into a contained area within the site;
- Vehicles leaving the site to be inspected for any plant material and washed down into a contained area;
- Vehicles used in the transport of infested material will need to be visually checked and washed down into a contained area before being used for any other work, either on the same site or at a different site;

[6] TII guidance The Management of Invasive Alien Plant Species on National Roads – Technical Guidance (Transport Infrastructure Ireland, 2020).

- Material gathered in dedicated wash down contained areas will need to be appropriately treated along with other contaminated soil on site;
- If soil is imported to the site for landscaping, infilling or embankments, the Contractor shall gain documentation from suppliers that it is free from non-native invasive species;
- Ensure all site users are aware of measures to be taken and alert them to the presence of the IAPS Management Plan;
- Erection of adequate site hygiene signage in relation to the management of non-native invasive material.

4.7 Management of Invasive Alien Plant Species During Operation

Following construction, the IAPS management plan will be updated for the operational phase, taking into account the results of the detailed construction non-native invasive species management plan and operational maintenance requirements. Follow on treatment methods such as chemical treatment may be employed if specified in the requirements for ongoing control.

As part of the operation phase there will need to be on-going treatment of invasive species at the locations of the permanent works including for example at the embankment. Site hygiene protocols will need to be implemented as part of the maintenance regime to prevent spread of IAPS.

5 Conclusion

The purpose of this IAPS management plan is to present the strategy that will be adopted during the construction and operation of the proposed flood relief scheme to manage and prevent the spread of the invasive alien plant species.

This plan is intended to be a working document and will be updated by a qualified ecologist during both the construction and operation phases. All the content provided in this Plan will be delivered in full by the Contractor and its finalisation by the Contractor will not affect the robustness and adequacy of the information presented here and relied upon in the EIAR and NIS.

Given the nature of the species and the rate of growth, the footprint of the proposed flood relief scheme will need to be re-surveyed prior to works. Advance treatment is proposed. Site hygiene will be particularly important on sites where invasive alien plant species are present. Incoming vehicles, and equipment (including footwear worn by contractors) will need to be cleaned and inspected before coming on site to prevent the further spread of the plant. The treatment method will be chosen on a site by site basis and regardless of the method chosen, the spread of invasive alien plant species arising from construction activities will be managed and prevented.

Where possible infested material will remain on site and be re-used. Any infested material that must be removed off site to landfill or other suitable facility will require a licence from the NPWS.

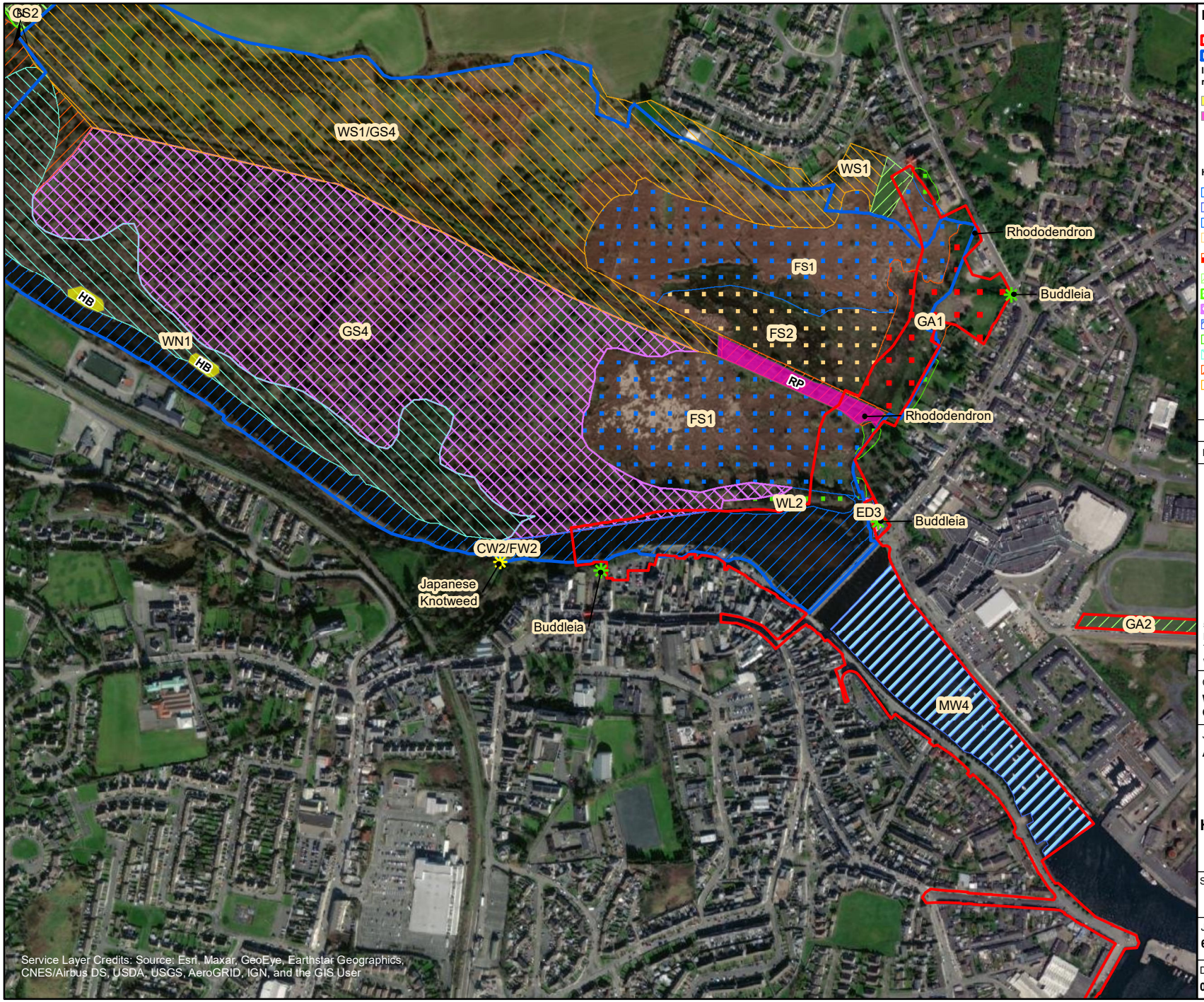
The IAPS management plan must be clearly communicated to all site staff and must be adhered to if it is to be implemented successfully.

Following construction, the Plan will be updated for the operational phase, considering the results of the construction IAPS management plan and operational maintenance requirements. This will include a strategy to protect the flood protection structures.

Appendix A (of Invasive Alien Plant Species Management Plan)

Habitat and Invasive Species Survey

A4



Legend

- Arklow FRS Boundary
- pNHA Boundary

Invasive Species (Approximate location, do not rescale)

- HB Himalayan Balsam
- RP Rhododendron ponticum
- Buddleia
- Japanese Knotweed

Habitat

- CW2 Tidal rivers/FW2 Depositing lowland rivers
- ED3 Recolonising bare ground
- FS1 Reed and tall sedge swamps
- FS2 Tall-herb swamps
- GA1 Improved agricultural grassland / GS4 Wet land
- GA2 Amenity grassland
- GS2 Dry meadows and grassy verges
- GS4 Wet grassland
- MW4
- WL2 Treelines
- WN1 Oak-birch-holly woodland
- WS1 Scrub
- WS1 Scrub / GS4 Wet Grassland

Issue	Date	By	Chkd	Appd
D2	2021-04-16	LM	LG	FP

Kilometers

0 0.075 0.15 0.3

ARUP

50 Ringsend Road
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Client

Wicklow County Council
Office of Public Works

Job Title

Arklow Flood Relief Scheme

Habitat and Invasive Species Survey

Scale at A4

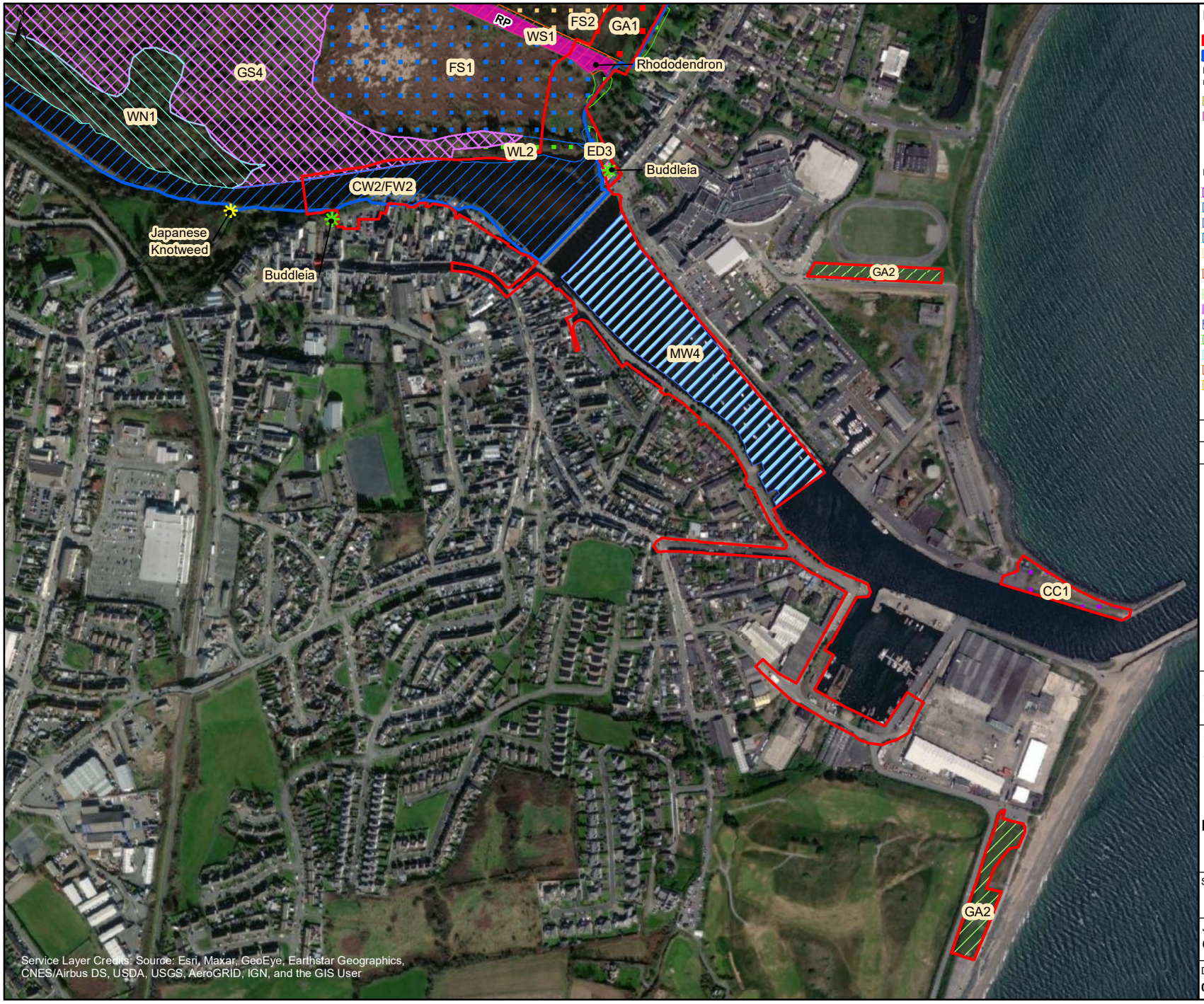
1:8,000

Job No	Drawing Status
605246-40	**Issue**

Drawing No	Issue
001	**I1**

21/03/2018 11:12:09

A4



Legend

- Arklow FRS Boundary
- pNHA Boundary

Invasive Species (Approximate location, do not rescale)

- HB Himalayan Balsam
- RP Rhododendron ponticum
- Buddleia
- Japanese Knotweed

Habitat

- CC1 Sea walls, piers and jetties
- CW2 Tidal rivers/FW2 Depositing lowland rivers
- ED3 Recolonising bare ground
- FS1 Reed and tall sedge swamps
- FS2 Tall-herb swamps
- GA1 Improved agricultural grassland / GS4 Wet land
- GA2 Amenity grassland
- GS4 Wet grassland
- MW4
- WL2 Treelines
- WN1 Oak-birch-holly woodland
- WS1 Scrub
- WS1 Scrub / GS4 Wet Grassland

Issue	Date	By	Chkd	Appd
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605246-40	**Issue**

Drawing No	Issue
001	**I1**

21/03/2018 11:12:09

Appendix D of CEMP

Soil Management Plan

Appendix C – Soil Management Plan

As a minimum the plan will provide the following information.

General requirements of the plan

The plan will include:

- maps showing topsoil and subsoil types and areas to be stripped;
- methods for stripping, stockpiling, respreading and improving the soils, including outline of equipment used and it's suitability;
- consideration of haul routes;
- location and content of each soil stockpile;
- schedules of volumes for each material;
- expected after-use for each material,
- who is responsible for supervising soil management; and,
- consideration of all work packages and enabling works.

Outline template

The plan will be developed in line with the following contents list.

Contents

1. Introduction

1.1. Introduction

1.1.1 Environmental control and management measures

To include high-level description of the source of mitigation measures adopted

1.1.2 Control and Management Plans,

Section considers all plans outlines in the NIS/EIAR where there may be crossover to ensure robust encompassing approach. E.g. Archaeological Strategy, Biodiversity Mitigation Strategy, Dredge material management plan, waste and materials management plan, etc.

Section lists the plans and procedures that will be developed for each stage of the Proposed Development, to set out in detail the soil management systems and approach that will be implemented during construction to comply with the CEMP.

1.1.3 Review and update of this plan and the CEMP

Description of approach to update documents as required.

1.1.4 Roles and Responsibilities

Specific job titles, roles and responsibilities will be clearly defined by the Contractor

Soil Resource

Outline out soils types present in the scheme area and their physiochemical properties including risk of erosion

Forms, Registration, and Permits

Outline of any requirements

Good Practice Mitigation

General CEMP, EIAR and NIS Measures Relevant to this Plan

General principals of soil handling

Seasonal Working Constraints

Determining Soil conditions

Field testing of soil conditions

Stop conditions

To include adverse weather

Soil Handling Good Practice

To include the soil handling procedures guidance used and list of equipment/machinery

Pre-Construction Site Preparation

Importing soils to site

Soil stripping

Creation of soil stockpiles

Stockpile Maintenance

Transport of soils on and offsite

Reinstatement

General methods

Excavation of soil stockpiles,

Placement of excavated materials,

Soil reinstatement

Aftercare

Responsibilities and content of the aftercare

Period of the aftercare

Biosecurity

Soil Resource and Sensitivity

Monitoring Schedule

It is suggested that a table is used to summarises the record keeping, monitoring and reporting requirements during construction phase. A description of responsibilities and the duration of monitoring will be included.

References

To include (but not be limited to) suitable industry best practice guidance (such as CIRIA, Defra(UK)), legislation and regulations (as relevant), soils survey map, and relevant reports.

Appendix D of CEMP

Construction and By-Products Waste Management Plan

Contents

1 Introduction

This Construction and By-Products Waste Management Plan (CBWMP) has been prepared as part of the Environmental Impact Assessment Report (EIAR) for the proposed Arklow Flood Relief Scheme, Arklow, Co. Wicklow.

This document has been prepared in accordance with the Department of the Environment, Heritage and Local Government *Best Practice Guidelines for the Preparation of Waste Management Plans for Construction and Demolition Projects, 2006*[1].

Following appointment, the Contractor will be responsible for detailing and maintaining this report and updating it as appropriate.

Following each update, a copy of the updated report shall be provided to Wicklow County Council and the Office of Public Works by the Contractor.

2 Waste Management Objectives for the Project

The principal objective of sustainable resource and waste management is to use material resources more efficiently, where the value of products, materials and resources is maintained in the economy for as long as possible and the generation of waste is minimised. To achieve resource efficiency there is a need to move from a traditional linear economy to a circular economy (refer to **Figure 1**, which illustrates the concept of a circular economy).

However, where residual waste is generated, it should be dealt with in a way that follows the waste hierarchy set out in the European Communities (Waste Directive) Regulations 2011 (S.I. No. 126/2011) (see **Figure 2**, which illustrates the waste pyramid) and actively contributes to the economic, social and environmental goals of sustainable development.

[1] Department of the Environment, Heritage and Local Government (DoEHLG), 2006. *Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects.*

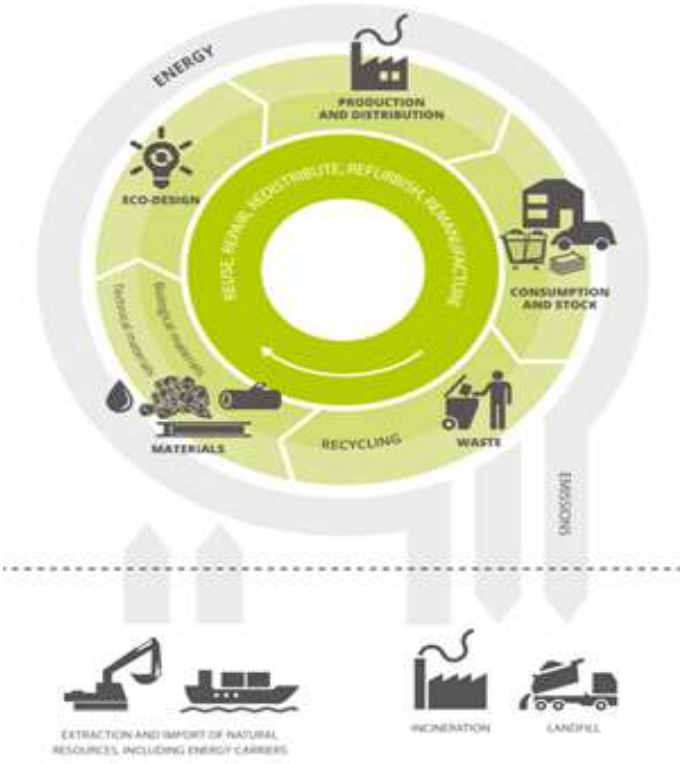

Figure 1: Circular Economy[2]

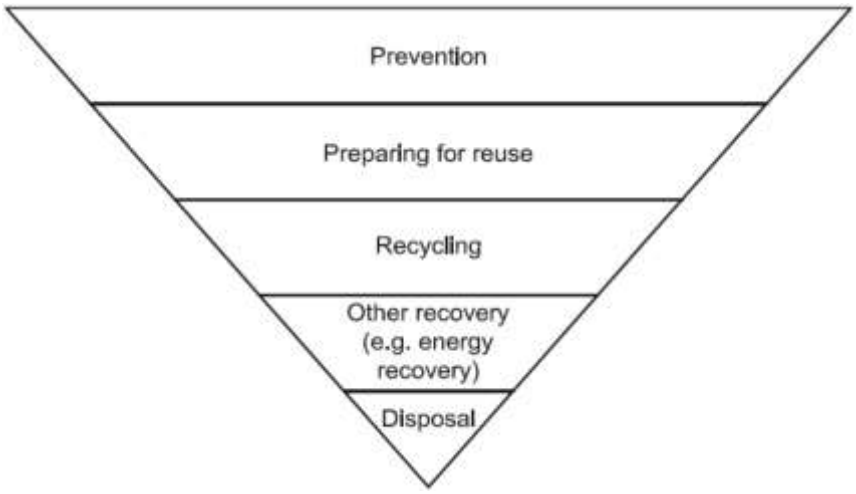

Figure 2: Waste Hierarchy[3]

[2] European Environment Agency (2019). Circular Economy – A simplified model of the circular economy for materials and energy. Available from: https://www.eea.europa.eu/media/infographics/circular-economy/view [Accessed: 13 April 2021]
[3] European Communities (Waste Directive) Regulations 2011 (S.I. No. 126/2011)

3 Roles, Responsibilities and Training

The nominated waste manager responsible for implementation of this Plan will be identified prior to the commencement of works.

Copies of the Plan will be made available to all relevant personnel on site.

All site personnel and sub-Contractors will be provided with a copy of the Plan and will be informed of the objectives of the Plan and their responsibilities in relation to compliance with the Plan.

The waste manager shall ensure that, where training is required regarding the handling and management of wastes on site, this is provided to staff as required.

The waste manager will be responsible for informing Contractor staff and sub-Contractors of content of the Plan and for maintaining and keeping the Records set out below.

In the event of the waste manager leaving the project team the Contractor will nominate a suitable replacement.

4 Wastes Arising

4.1 Introduction

Construction and Demolition (C&D) waste is defined as waste which arises from construction, renovation and demolition activities.

Also included within the definition are surplus and damaged products and materials arising in the course of construction work or used temporarily during the course of on-site activities.

Typical construction and demolition waste types which are likely to arise during the proposed site clearance and demolition, excavation and construction works are set out below.

The Contractor will ensure that waste generation on site is minimised and that waste removed from site for recovery or disposal is reduced where feasible.

4.2 Site Clearance and Demolition

4.2.1 Wastes Arisings

Prior to commencing work, the contractor will need to undertake vegetation removal and stripping of topsoil as required in the relevant working areas. It is proposed to remove the vegetation growing on Arklow Bridge as part of the works.

Minor demolition will be undertaken as part of the enabling works for the proposed scheme. The demolition works will include the following:

- At Arklow Bridge, demolition of the existing concrete scour protection slab;
- Upstream of Arklow Bridge on the river's southern bank along River Walk, demolition of the existing tarmac road surface, footpaths, river access, kerbs and concrete quay wall will be undertaken to accommodate the construction of the flood defence walls;
- Along South Quay, from Arklow Bridge to the existing slipway, demolition of the Coal Quay slipway, and demolition of the existing concrete quay wall along two short lengths will be undertaken to accommodate the construction of the new flood defence walls;
- In the Dock area, extending along the western and southern sides of the dock, demolition of the existing tarmac road surface and the fence around the Dock will be undertaken to accommodate the construction of the flood defence wall; and
- Along River Walk, South Quay and the Dock area, demolition of the existing tarmac road surfaces in these areas will be undertaken to accommodate the construction of a surface water drainage network and pumping stations.

Approximately 5,978 tonnes of surplus materials will be generated as a result of the demolition works to facilitate the proposed scheme. This material will be predominantly comprised of concrete and tarmac.

4.2.2 Waste Management

Where naturally occurring material is excavated this will be reused within the construction works as required, provided it is suitable for its proposed use.

Surplus materials or by-products generated as a result of the proposed scheme which are not naturally occurring and which will be reused within the scheme will be notified to the EPA in accordance with Article 27 of the European Communities (Waste Directive) Regulations, 2011 as a by-product, provided it meets the requirements of that clause.

Where surplus materials or by-products which are generated as a result of the proposed scheme and which will be reused within other schemes, will be notified to the EPA in accordance with Article 27 of the European Communities (Waste Directive) Regulations, 2011 as a by-product, provided it meets the requirements of that Article.

Where surplus materials are generated, which cannot be reused within the scheme or other construction works, these will be waste and will be delivered to facilities authorised in accordance with the Waste Management Act, 1996 as amended, and which hold a Certificate of Registration, Waste Facility Permit or EPA Licence.

4.2.3 Demolition Audit

In addition to the general measures outlined above, a waste audit in accordance with the EU *Guidelines for the waste audits before demolition and renovation works of buildings*[4], or similar guidance will be considered at detailed design stage.

The above guidelines provide guidance on best practices for the assessment of construction and demolition waste streams prior to demolition or renovation of buildings and infrastructure, called a "waste audit". The aim of the guidance is to facilitate and maximize recovery of materials and components from demolition or renovation of buildings and infrastructures for beneficial reuse and recycling, without compromising the safety measures and practices outlined in the EU *Construction and Demolition Waste Management Protocol*[5].

4.3 Land Based Excavation

4.3.1 Waste Arisings

Land based excavated material as part of the construction works will generally consist of:

- Topsoil;
- Subsoil; and
- Made ground.

The following activities will result in the generation of land based excavation material during the construction phase of the proposed scheme:

- Works at river access and site compound access locations;
- Works at Arklow Bridge;
- Works at Ferrybank – removal of pipelines;
- Construction of flood defence walls and drainage infrastructure along South Quay; and
- Construction of flood defence walls and earth embankment at Arklow Marsh.

The total quantity of land based excavated materials from the proposed scheme is estimated to be 34,733 tonnes. This represents a conservative worst-case estimate which includes an additional miscellaneous allowance of 10% on the overall total figure.

[4] European Commission, 2018. *Guidelines for the waste audits before demolition and renovation works of buildings.*

[5] *European Commission, 2016. Construction and Demolition Waste Management Protocol.*

A breakdown of the quantity of this material that will be generated from the different elements of the scheme works is presented in **Table 1**.

Table 1: Land Based Excavation Quantities

Scheme Works	**Tonnes** *Note 1*
Flood Defence Walls (Sheet Piles)	900
Flood Defence Walls (River Channel)	4,876
Flood Defence Walls (North Bank)	496
Flood Earth Embankment	19,360
Vehicle Ramp (Riverwalk)	86
Vehicle Ramp 1 (Docks)	28
Vehicle Ramp 2 (Docks)	38
Drainage (Riverwalk)	776
Drainage (South Quay)	2,288
Drainage (Docks)	2,658
Pump Station 1 – Riverwalk	12
Pump Station 2 – South Quay	32
Pump Station 3 – Dock	26
Miscellaneous Allowance (10%)	3,157
Total	**34,733**

Note 1: A conversion factor of 2.0 was used to convert from m^3 to tonnes.

4.3.2 Waste Management

As noted in Section 1 above, following appointment, the Contractor will be responsible for detailing this Plan and providing it to Wicklow County Council and the Office of Public Works for approval. The detailed Plan will include a description of how land-based excavation material from the proposed development will be managed. A full list of all facilities to which uncontaminated excavation material will be sent will be provided in the detailed Plan.

It will be at the discretion of the Contractor to determine how land-based excavation material from the proposed development will be managed. It is assumed, as a worst-case scenario, that all excavated soil will be treated or disposed of at an authorised facility, either in Ireland or abroad. However, all of the below options may also be used.

4.3.2.1 Prevention and Reuse

Topsoil, soil, rock and naturally occurring material excavated in the course of construction activities will be reused within the proposed scheme where feasible, subject to further testing to determine if materials meet the specific engineering standards for their proposed end-use.

This is not deemed to be a waste in accordance with Article 2 of the Waste Directive 2008/98/EC, the European Communities (Waste Directive) Regulations, 2011 and Section 3 of the Waste Management Acts, 1996-2011 as amended.

Surplus materials or by-products generated as a result of the proposed scheme, which are not naturally occurring, and which will be reused within the scheme will be notified to the EPA in accordance with Article 27 of the European Communities (Waste Directive) Regulations, 2011 as a by-product, provided it meets the requirements of that Article.

4.3.2.2 Waste Recovery (including recycling) and Disposal

Where surplus materials are generated which cannot be reused within the scheme or other construction works these will be waste and will be delivered to recovery and disposal facilities authorised in accordance with the Waste Management Act, 1996, as amended, and which hold a Certificate of Registration, Waste Facility Permit or EPA Licence.

4.4 Excavation from the Riverbed

4.4.1 Waste Arisings

Channel dredging works are proposed to lower the level of the riverbed in the Avoca river for 320m upstream and 520m downstream of Arklow Bridge. In general, the riverbed will be 1.0m lower at Arklow Bridge and taper to existing bed levels at the upstream and downstream extents. The dredging will extend to within 2m of the existing riverbanks or proposed river walls, as applicable.

A total of approximately 168,826 tonnes of sediment is required to be dredged upstream and downstream of Arklow Bridge. Approximately 25,600 tonnes of excavated material from the riverbed will be reused on site. The remaining approximately 143,226 tonnes of excavated material from the riverbed will be removed from site. The design team has undertaken material testing. The approximate breakdown of the classification of the excavated material from the riverbed is shown is shown in **Table 2**.

Table 2: Material Classification

Material classification	**Percentage of total material excavated from the riverbed**	**Approximate quantity (tonnes)**
Natural sands and gravels	70	118,626
Natural sands and gravels with slightly elevated chloride concentrations	20	33,400
Non-hazardous waste	7	11,800
Hazardous waste	3	5,000
Total	**100**	**168,826**

4.4.2 Waste Management

4.4.2.1 Prevention

Approximately 25,600 tonnes of excavated material from the riverbed will be reused on site. This naturally occurring material will primarily be reused to construct a flood embankment along the edge of Arklow Town Marsh. Further smaller volume options include as fill material for regrading works, backfill behind new flood walls and around new buried utility installations. This material is not considered a waste in accordance with Article 2 of the Waste Directive 2008/98/EC, the European Communities (Waste Directive) Regulations, 2011 and Section 3 of the Waste Management Acts, 1996-2011 as amended.

It will be the responsibility of the contractor to ensure all material which is reused on site as a by-product complies with the relevant legislation including Article 27 of the European Communities (Waste Directive) Regulations, 2011.

Where onsite reuse of by-product material requires a notification to the EPA, it will be the responsibility of the contractor to ensure compliance with Article 27 of the European Communities (Waste Directive) Regulations, 2011.

Following excavation, the material may be required to be stored within the site boundary pending reuse.

The remaining approximately 143,226 tonnes of excavated material from the riverbed will be removed from site. Material that meets the TII Specification for Road Works, Series 600, Table 6/1 and complies with condition (d) of Article 27 and the EPA guidelines will be suitable for beneficial reuse off site as a construction material.

Off-site construction reuse options include quarry infilling, site restoration, coastal protection schemes and flood relief schemes or offshore for reclamation or coastal protection schemes with works below the high-water mark. Offshore works below the high-water mark would require additional foreshore licensing. The destination site which will use the material will have granted planning permission for the proposed use and offshore works below the high-water mark will have the required foreshore licence in place. It will be the responsibility of the contractor to ensure all material reused off site as a by-product complies with the relevant legislation including Article 27 of the European Communities (Waste Directive) Regulations, 2011, and planning and foreshore licence legislation. In 2018, the EPA determined that 907,000 tonnes of the soil and stone notified were by-products, as notified, under Article 27[6].

The contractor will be responsible for identification of suitable sites for reuse of the material in accordance with Article 27 of the European Communities (Waste Directive) Regulations, 2011.

[6] EPA (2020). *Construction & Demolition Waste Statistics for Ireland. Latest Reference Year: 2018 [Online].* Available from: http://www.epa.ie/nationalwastestatistics/constructiondemolition/ [Accessed: 15 April 2021].

4.4.2.2 Recycling / Recovery

For excavated material from the riverbed which is not a by-product, this will be a waste and testing will be undertaken to determine if it is suitable for delivery to recovery facilities authorised in accordance with the Waste Management Act, 1996 as amended, for recycling/soil recovery. There are 20 soil recovery sites currently operating in Wicklow and Wexford with approximately 583,974[7] tonnes/annum capacity to accept dredged material or soil and stones. Therefore, it is reasonable to anticipate there will be sufficient available capacity to accept any suitable material from the proposed scheme.

4.4.2.3 Disposal

Where excavated material from the riverbed is not a by-product and does not meet the test criteria for recycling or reuse it will be delivered to authorised disposal facilities. Inert landfill options include the following:

- IMS Ltd., Hollywood, the Naul, Co. Dublin;
- Murphy Concrete Manufacturing, Gormanstown, Co. Meath; and
- Walshestown Restoration Ltd., Walshestown, Co. Kildare.

The hazardous and non-hazardous material identified at the proposed dredging site can only be disposed of at hazardous and non-hazardous facilities respectively. Approximately 11,800 tonnes of material identified upstream of Arklow bridge is categorised as non-hazardous in accordance with the EPA 'Guidance on waste acceptance criteria at authorised soil recovery facilities'[8] and the EPA 'Guidance on Soil and Stone By-products'[9]. This material will be disposed of at a licenced landfill for non-hazardous waste. Non-hazardous options include the following:

- Drehid Waste Management Facility (Bord Na Mona), Co. Kildare;
- Knockharley Landfill, Co. Meath; and
- Ballynagran Residual Landfill (Greenstar), Co. Wicklow.

[7] Note - the capacity of soil recovery sites in Wicklow and Wexford was calculated in April 2021 and is, as such, a more up-to-date estimate than that provided in Appendix 15.3 - Dredge Material Management Study.

[8] EPA (2020). *Guidance on Waste Acceptance Criteria at Authorised Soil Recovery Facilities. EPA, Johnstown Castle, Wexford, Ireland.*

[9] EPA (2019). *Guidance on Soil and Stone By-products in the context of article 27 of the European Communities (Waste Directive) Regulations 2011*. Version 3. EPA, Johnstown Castle Estate, Wexford, Ireland.

Approximately 5,000 tonnes of material identified upstream of Arklow bridge is considered hazardous in accordance with the Waste Acceptance Criteria (WAC)[10] and must be disposed of at an authorised hazardous waste management facility.

There is currently limited capacity for hazardous excavated and dredged soils in Ireland, and this may continue into the future. If required, this material may be exported to authorised facilities which have capacity. Transportation of this material abroad will take place in accordance with relevant legislation including the provisions of the Waste Management (Shipments of Waste) Regulations, S.I. 419 of 2007. In 2019, Ireland produced 90,595 tonnes of contaminated soils, 29,063 tonnes of which was treated in Ireland, with the remainder exported.[5]

4.5 Construction

4.5.1 Waste Arisings

Construction works, site offices and temporary works facilities are also likely to generate waste. General construction waste can vary significantly from site to site but typically may include the following non-hazardous fractions:

- Soil and stone;
- Concrete, brick, tiles and ceramics;
- Asphalt/tar;
- Metals;
- Wood; and
- Other.

General construction waste will also include surplus and damaged products and materials arising in the course of construction work or used temporarily during the course of on-site activities.

In the case of the proposed scheme, the most likely type of general construction waste will be surplus concrete and unusable or damaged pipe segments which may arise on site. Quantities of the above materials are estimated to be small.

4.5.2 Waste Management

The Contractor shall take the following measures to prevent waste, facilitate recycling and minimise waste disposal during the construction phase:

- Source Segregation: Where possible, metal, timber, glass and other recyclable material will be segregated and removed off site to a permitted/licensed facility for recycling. Waste stream colour coding and photographs will be used to facilitate segregation.

[10] European Council (2003). *Council Decision 2003/33/EC of 19th December 2002 establishing criteria and procedures for the acceptance of waste at landfills pursuant to Article 16 of and Annex II to Directive 1999/31/EC*.

- Office and food waste arising on site will be source separated at least into dry mixed recyclables, biodegradable residual wastes.
- Waste bins, containers, skip containers and storage areas will be clearly labelled with waste types which they should contain, including photographs as appropriate.
- The site will be maintained to prevent litter and regular litter picking will take place throughout the site.
- Material Management: 'Just in time' delivery will be used so far as is reasonably practicable to minimise material wastage.
- Waste Auditing: The Contractor will record the quantity in tonnes and types of waste and materials leaving the site during the demolition works. The name, address and authorisation details of all facilities and locations to which waste and materials are delivered will be recorded along with the quantity of waste in tonnes delivered to each facility. Records will show material which is recovered and disposed of.
- Paints, sealants and hazardous chemicals etc. will be stored in secure, bunded locations.
- All hazardous waste will be separately stored in appropriate lockable containers prior to removal from site by an appropriate waste collection holder.
- Waste generated on site will be removed as soon as practicable following generation for delivery to an authorised waste facility.
- The contractor will ensure that any off site interim storage facilities for excavated material have the appropriate waste licences or waste facility permits in place.

Surplus construction materials will be reused within the proposed scheme or at other construction sites. The feasibility of reuse as a by-product will be investigated by the contractor and undertaken where feasible in accordance with Article 27 of the European Communities (Waste Management) Regulations, 2011.

The contractor will ensure that the appropriate waste authorisation is in place for all facilities that the material is delivered to (i.e. EPA Licence, Waste Facility Permit or Certificate of Registration).

5 Waste Collection

Waste from site clearance, demolition, excavation and construction will be transported by authorised waste collectors in accordance with the *Waste Management (Collection Permit) Regulations, 2007 as amended*.

An up to date list of all waste collectors used to transport waste from site during the proposed scheme works will be maintained on site and updated by the Contractor. A sample summary table template is included as **Table 3.**

Copies of valid appropriate waste collection permits will be held on site by the contractor.

Table 3: Waste Collection Permits – Sample Table

Waste Collector	Address	Waste Collection Permit Number	Waste Types Collected – List of Waste Code	Waste Types Collected – Text Description

6 Waste Recovery and Disposal Offsite

Waste from demolition and construction will be delivered to authorised waste facilities in accordance with the *Waste Management Acts 1996 to 2011, as amended.*

An up to date list of all waste facilities to which waste from the site will be delivered will be maintained on site and updated by the Contractor. A summary table template is included as **Table 4**.

Copies of valid facility Certificates of Registration, Waste Facility Permits and Waste Licences will be held on site by the Contractor.

Table 4: Waste Facilities – Sample Table

Waste Facility Name	Address	Waste Licence/Waste Permit/Certificate of Registration Number	Regulatory Authority	Waste Types to be Delivered – List of Waste Code	Waste Types to be Delivered – Text Description

7 Costs of Waste Management

As required by the *Department of the Environment, Heritage and Local Government Best Practice Guidelines on the Preparation of Waste Management Plans for Construction & Demolition Projects* this section addresses costs of waste management.

While landfill disposal has been the most commonly used method for waste management in Ireland in the past, waste to energy incinerators are also now in operation at Poolbeg, Dublin 4 and in Carranstown, County Meath.

Typically, the current cost of disposal of waste to landfill in Ireland exceeds €170 per tonne. From 1st July 2013 in accordance with the Waste Management (Landfill Levy) (Amendment) Regulations 2013 the 'landfill levy' increased to €75 per tonne for waste disposed to landfill.

In addition to landfill operator fees and landfill levies there are additional costs included in the 'true cost of waste management' including:

- The purchase cost of waste materials (including imported soil);
- Handling costs;
- Storage and transportation costs; and
- Revenue generated from sales.

Therefore, in order to reduce costs associated with waste management, surplus materials should be reused and recycled where possible and materials should be carefully stored and handled to minimise risk of damage.

8 Record Keeping and Auditing

The Contractor will record the quantity in tonnes and types of waste and materials leaving the development site during the site clearance and demolition, excavation and construction phases.

The name, address and authorisation details of all facilities and locations to which waste and materials from the proposed development are delivered will be recorded along with the quantity of waste in tonnes delivered to each facility and the date of the waste movement. Records will show material which is recovered and disposed of.

The waste manager will arrange for a waste audit of the project once demolition has fully commenced on site and of any facilities to which demolition waste from the project is delivered as required. The waste manager will also arrange for a waste audit of the project once construction has fully commenced on site and of any facilities to which construction waste from the project is delivered as required.

Appendix E of CEMP

Pest Control Plan

Appendix E – Pest Control Plan

The Environmental Health Service has produced an information leaflet detailing how to control rodents in the construction industry. Regard has been given to this information leaflet and the recommendations of the Health Service Executive submission in the compilation of the measures below.

(https://www.hse.ie/eng/services/publications/environmentalhealth/rodent-control-for-the-construction-industry.pdf).

The Pest Control Plan provided below is consistent with the Environmental Commitments as contained within the EIAR. This PCP is a working document and will be finalised by the Contractor following appointment and in agreement with the Project Ecologist and prior to commencing works on site to include any additional requirements stipulated by An Bord Pleanála should the proposed development be approved. All of the content provided in this PCP will be delivered in full by the Contractor and its finalisation by the Contractor will not affect the robustness and adequacy of the information presented here and relied upon in the EIAR.

1. Survey

A site survey by a professional Pest Control company shall be undertaken at least four weeks prior to any demolition or site clearance works commencing to identify evidence of rodent infestations. Where rodent infestations are identified, appropriate treatments shall be first reviewed with the Project Ecologist, (having regard to requirements in the Wildlife Acts 1976-2019, EU Birds and Habitats Directives, European Communities (Birds and Natural Habitats) Regulations, 2011 and the Environmental Commitments in the EIAR). The treatments shall be implemented to eliminate infestations prior to demolition or site clearance. Pest monitoring shall be undertaken on site during demolition/construction works.

2. Construction site

The following shall also be carried out:

- *All refuse shall be removed from site.*
- *Old drains and other disused pipes shall either be filled with concrete, or alternatively dug out and the junctions with working drains sealed.*
- *Old foundations, cesspits, cavities, etc., shall be backfilled with suitable hardcore, well consolidated and covered with a layer of concrete.*

3. Sewers and Drains

Care shall be taken by the Contractor not to damage drains or sewers when using machinery, as this can provide an access route for rats onto the site. Old redundant sewers and drains shall be capped and removed where possible. Additionally, the following shall be carried out:

- *During the laying of new drains, the sewers, open pipe ends and*

manholes shall be protected against entry by rodents when work is not in progress – particularly at night time.

- *Surface water pipes discharging into a watercourse shall be fitted with a non-return valve at the outlet.*

4. Hygiene

It is essential that a good standard of hygiene be maintained on site during the course of construction if rodents are not to be attracted to it. The following shall be carried out:

- *Waste food, empty food tins, and other waste which might attract rodents shall be stored in bins with tight fitting lids.*
- *Accumulations of old timber, bricks and debris, provide harbourage for rodents and shall be cleared away as quickly as is possible.*
- *Stocks of building material shall be neatly stored.*
- *Contractors shall ensure that the construction site is kept as clean and tidy as possible, and any food debris should be stored in a pest proof container within the welfare facility.*