SLANE BYPASS & PUBLIC REALM ENHANCEMENT SCHEME

APPROPRIATE ASSESSMENT

Volume 5 – Natura Impact Statement

Tionscadal Éireann
Project Ireland
2040

An Roinn Iompair
Department of Transport

Bonneagar Iompair Éireann
Transport Infrastructure Ireland

comhairle chontae na mí
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WESTMEATH NATIONAL ROADS OFFICE
Oifig na hIarmhí um Bhóithre Náisiúnta

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Glossary

Term	Meaning
Annex I habitat	Habitat types listed on Annex I of the EU Habitats Directive whose conservation requires the designation of Special Areas of Conservation.
Annex II species	Species listed on Annex II of the EU Habitats Directive whose conservation requires the designation of Special Areas of Conservation.
Annex I birds	Birds listed on Annex I of the EU Birds Directive whose conservation requires the designation of Special Protection Areas.
Appropriate Assessment (AA)	An assessment carried out under Article 6(3) of the Habitats Directive as to whether or not a proposed development would adversely affect the integrity of a European site.
Appropriate Assessment Concluding Statement	The determination by the competent authority under Article 6.3 of the Habitats Directive on an appropriate assessment and the reasons for the determination.
Birds Directive	Council Directive 2009/147/EC on the conservation of wild birds.
Conservation Objective (CO)	A conservation objective aims to define favourable conservation status/condition using suitable attributes with targets.
Competent Authority	The regulatory body (or consent authority), in this case, Meath County Council.
European Commission (EC)	The Commission of the European Communities.
European site	'European site' has the meaning given to it by Section 177R of Part XAB of the Planning and Development Acts, 2000 – 2022, as amended and Part 1(2)(1) of the European Communities (Birds and Natural Habitats) Regulations 2011 S.I No 477/2011 as amended. Collective term used when referring to nature conservation sites protected under the Habitats or Birds Directives (SACs or SPAs).
Habitats Directive	Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.
Mitigation Measures	Measures designed to avoid, minimise and mitigate adverse effects on European site integrity.
Natura 2000	The Natura 2000 network is defined under the Habitats Directive 92/43/EEC (Article 3) and the Birds Directive 2009/147/EC (Article 4) as a coherent European ecological network of Special Areas of Conservation (SAC) and Special Protection Areas (SPA).
Natura Impact Statement (NIS)	'Natura impact statement' shall be construed in accordance with Section 177T of the Planning and Development Acts, 2000 – 2022 (as amended) and Part 1(2)(1) of the European Communities (Birds and Natural Habitats) Regulations 2011 S.I No 477/2011 as amended. The report of a scientific examination of a plan or project and the relevant European sites, to identify and characterise any possible implications for the site(s) in view of the site's conservation objectives, to enable a consent authority to carry out an appropriate assessment.
Natural Heritage Area (NHA)	This is an area considered important for the habitats present or which holds species of plants and animals whose habitat needs protection.
Priority Annex I habitat	Annex I habitat types which are in danger of disappearance. Priority habitats are indicated by an asterisk (*) in Annex I of the Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora.
Qualifying Interest (QI)	Relates to the habitats and/or (non-bird) species for which an SAC or SPA is selected.
Q-Value	An ecological quality rating that reflects average water quality at any location.
Screening for Appropriate Assessment	The screening of a plan or project to establish if an appropriate assessment of the plan or project is required. The Screening for AA assesses whether, in view of best scientific knowledge, if the proposed development, individually or in combination with other plans or projects is likely to have a significant effect on a European site.
Site-Specific Conservation Objectives (SSCO)	A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.
Source-Pathway-Receptor (S-P-R) Model	A source-pathway-receptor model is a standard tool used in environmental assessment. In order for an effect to be likely, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism may result in no likelihood for the effect to occur.

Term	Meaning
Special Areas of Conservation (SACs)	SACs are sites designated under European Communities Directive 92/43/EEC known as the 'Habitats Directive'. This requires the conservation of important, rare or threatened habitats and species across Europe. SACs are composed of sites hosting the Qualifying Interest (QI) habitat types listed in Annex I and/ or species listed in Annex II (under Habitats Directive Article 3).
Special Conservation Interests (SCI)	SPAs are composed of sites supporting SCI comprising Annex I bird species, regularly occurring migratory species and the supporting wetland habitats (under Article 4 Birds Directive).
Special Protection Areas (SPAs)	SPAs are sites designated under the European Communities Directive 2009/147/EC, known as the 'Birds Directive', to conserve the habitats of certain migratory or rare birds.
Strategic Environmental Assessment (SEA)	A systematic process for evaluating the environmental implications of a proposed policy, plan or programme and provides means for looking at cumulative effects and appropriately address them at the earliest stage of decision making alongside economic and social considerations.
Water Framework Directive (WFD)	An EU directive which commits European Union member states to improve the qualitative and quantitative status of all water bodies. It applies to rivers, lakes, groundwater, estuaries and coastal waters.
Zone of Influence (ZoI)	The zone of influence of a proposed development is the geographical area over which it could affect the receiving environment in a way that could have significant effects on environmental receptors. The ZoI is established on a case-by-case basis using the Source-Pathway-Receptor model.

Acronyms

Term	Meaning
AA	Appropriate Assessment
AEP	Annual Exceedance Probability
AOD	Above Ordnance Datum
AON	Apparently Occupied Nests
ASTM	American Society for Testing and Materials
BBS	Breeding Bird Surveys
BCI	Bat Conservation International
BCT	Bat Conservation Trust
BNHR	Birds and Natural Habitats Regulations
BOCCI	Birds of Conservation Concern in Ireland
BOD	Biological Oxygen Demand
CDP	County Development Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CJEU	Court of Justice of the European Union
CL	Conservation Limit
CMU	Catchment Management Unit
CO	Conservation Objective
Cu	Copper
CW	Constructed wetlands
DAU	Development Applications Unit
DCHG	Department of Culture, Heritage and the Gaeltacht
DECLG	Department of the Environment, Community and Local Government
DHLGH	Department of Housing, Local Government and Heritage
DCHG	Department of Culture, Heritage and the Gaeltacht
DEHLG	Department of the Environment, Heritage and Local Government
DPER	Department of Public Expenditure and Reform
DS	Downstream
DTTAS	Department of Transport, Tourism and Sport
EC	European Communities
EcIA	Ecological Impact Assessment
ECoW	Environmental Clerk of Works
EEC	European Economic Community
EOP	Environmental Operating Plan
EIAR	Environmental Impact Assessment Report
EIS	Ecological Impact Statement
EPA	Environmental Protection Agency
EQS	Environmental Quality Standards
EU	European Union
FWPM	Freshwater Pearl Mussel
GDA	Greater Dublin Area
GSI	Geological Survey Ireland
GWB	Groundwater Body
IAPS	Invasive Alien Plant Species

Term	Meaning
IFI	Inland Fisheries Ireland
IROPI	Imperative Reasons of Overriding Public Interest
ISMP	Invasive Species Management Plan
I-WeBS	Irish Wetland Bird Survey
LBAP	Local Biodiversity Action Plan
LCC	Louth County Council
LSE	Likely Significant Effect
MCC	Meath County Council
NASCO	North Atlantic Salmon Conservation Organisation
NBDC	National Biodiversity Data Centre
NDP	National Development Plan
NIFTI	National Investment Framework for Transport in Ireland
NIS	Natura Impact Statement
NPF	National Planning Framework
NPWS	National Parks and Wildlife Service
NRA	National Roads Authority
NSO	National Strategic Outcome
NTA	National Transport Authority
OPR	Office of the Planning Regulator
OSi	Ordnance Survey Ireland
PED	Pre-earthworks ditch
PV	Photovoltaic
QI	Qualifying Interest
RBMP	River Basin Management Plan
RS	River stations
SAC	Special Area of Conservation
SEA	Strategic Environmental Assessment
SCI	Special Conservation Interests
SHD	Strategic Housing Development
S.I.	Statutory Instrument
SID	Strategic Infrastructure Development
SNH	Scottish Natural Heritage
SPA	Special Protection Area
S-P-R	Source-Pathway-Receptor model
SSCO	Site-Specific Conservation Objectives
SuDS	Sustainable drainage system
TII	Transport Infrastructure Ireland
TON	Total Organic Nitrogen
TSS	Total Suspended Solids
UNESCO	United Nations Educational, Scientific and Cultural Organization
US	Upstream
WFD	Water Framework Directive
WWTP	Wastewater Treatment Plant
ZoI	Zone of Influence
Zn	Zinc

1 INTRODUCTION

1.1 Scope of Report

Meath County Council (MCC), under the auspices of Transport Infrastructure Ireland (TII), are developing a bypass of Slane Village to address a sub-standard section of the existing N2 National Primary Route. The Proposed Scheme also encompasses public realm enhancements and traffic management measures within Slane Village, together with works on the N51 between the proposed bypass and the centre of the village. The collective elements together make up the N2 Slane Bypass and Public Realm Enhancement Scheme, hereinafter referred to as the 'Proposed Scheme'. The Proposed Scheme is the project for the purposes of this assessment.

RPS was commissioned by MCC to prepare a Natura Impact Statement (NIS) to accompany the consent application for the Proposed Scheme to An Bord Pleanála. This NIS comprises a report of the scientific examination of evidence and data to determine whether the Proposed Scheme will result in any adverse effects on the integrity of European sites in view of best scientific knowledge and the conservation objectives of the sites. The assessment will be carried out with reference to the legal context outlined below in **Section 1.2**.

1.2 Legislative Context

1.2.1 European Context

The Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, better known as 'The Habitats Directive', provides protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of Community interest through the establishment and conservation of a European Union (EU) wide network of sites known as Natura 2000 (hereafter referred to as 'European sites'). Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests as they relate to Appropriate Assessment (AA).

Articles 6(3) states:

> *"Any plan or project not directly connected with or necessary to the management of the [European] site but likely to have a significant effect thereon, either individually or in combination with other plans or projects, shall be subjected to appropriate assessment of its implications for the site in view of the site's conservation objectives. In light of the conclusions of the assessment of the implications for the site and subject to the provisions of paragraph 4, the competent national authorities shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public."*

Article 6(4) states:

> *"If, in spite of a negative assessment of the implications for the [European] site and in the absence of alternative solutions, a plan or project must nevertheless be carried out for imperative reasons of overriding public interest, including those of a social or economic nature, Member States shall take all compensatory measures necessary to ensure that the overall coherence of Natura 2000 is protected. It shall inform the Commission of the compensatory measures adopted."*

Each European site has assigned conservation objectives (COs) and a list of Qualifying Interests (QI's) and/ or Special Conservation Interest (SCI) species. The CO concept appears in the eighth recital of Directive 92/43/EEC which reads: "*whereas it is appropriate, in each area designated, to implement the necessary measures having regard to the conservation objectives pursued.*" Article 1 then explains that "*conservation means a series of measures required to maintain or restore the natural habitats and the populations of species of wild fauna and flora at a favourable status.*"

1.2.1.1 National Context

The requirements of the Habitats Directive have been transposed into Irish legislation principally through the Birds and Natural Habitats Regulations (BNHR) 2011, as amended, and Part XAB of the Planning and Development Acts, 2000 – 2022, as amended.

With regard to Conservation Objectives, the National Parks and Wildlife Service (NPWS) publish COs for European sites on their website. NPWS advise in the general introductory notes of their site-specific conservation objectives series publications, that an appropriate assessment based on their "*published conservation objectives will remain valid even if the conservation objective targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out.*" NPWS advise that to assist in that regard, it is essential that the date and version are included when objectives are cited.

1.3 Stages of Appropriate Assessment

The Department of the Environment Heritage and Local Government guidance for planning authorities (DEHLG, 2010) outlines 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 1.1** below, and an outline of the steps and procedures involved in completing each stage follows.

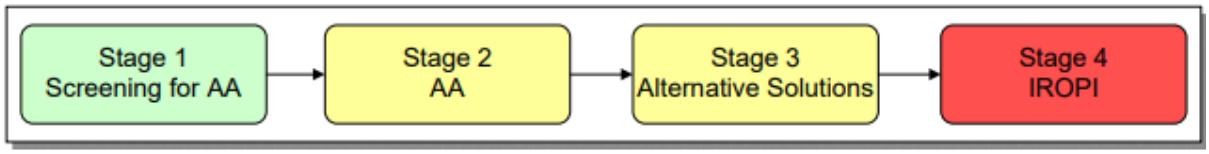


Figure 1.1: Four Stages of Appropriate Assessment

1.3.1 Stage 1: Screening/ Test of Significance

This process identifies whether the Proposed Scheme is directly connected to or necessary for the management of a European site(s) and identifies whether the development is likely to have significant effects upon a European site(s) either alone or in combination with other plans or projects.

The output from this stage is a determination of not significant, significant, potentially significant, or uncertain effects. The latter three determinations will cause the project to be taken forward to Stage 2 of the assessment process.

The Screening for AA for the Proposed Scheme is presented as part of the consent application under separate cover.

1.3.2 Stage 2: Appropriate Assessment (Natura Impact Statement)

This stage considers the impact of the Proposed Scheme on the integrity of a European site(s), either alone or in combination with other projects or plans, with respect to: (i) the site's conservation objectives; and (ii) the site's structure, function and its overall integrity. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts is undertaken.

The output from this stage is a NIS. This document must include sufficient information for 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, despite the application of measures to reduce or eliminate adverse effects, then the process must consider alternatives (Stage 3) or the plan or project should be abandoned.

This report is the Stage 2, Natura Impact Statement for this Proposed Scheme.

1.3.3 Stage 3: Assessment of Alternatives

If it is concluded at Stage 2 that adverse integrity will arise, the project is considered at Stage 3. This process examines alternative ways of achieving the objectives of the project that avoid adverse impacts on the integrity of the European site. If no alternatives exist or all alternatives would result in negative impacts to the integrity of the European sites then the process either moves to Stage 4 or the project is abandoned.

1.3.4 Stage 4: Assessment where Adverse Impacts Remain

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 Natura 2000 site to proceed in cases where it has been established that no less damaging

alternative solution exists. This stage includes identification of compensatory measures which must be shown to be practical, implementable, likely to succeed, proportionate and enforceable.

1.4 Screening for Appropriate Assessment

Stage 1 screening of the Proposed Scheme has been completed (as referenced above) and concluded that the Proposed Scheme was (i) not directly connected with or necessary to the management of the [European] site(s) and (ii) was likely to have a significant effects on the [European] site(s) either individually or in combination with other plans or projects. The European sites likely to be significantly affected were identified as the following:

- **River Boyne and River Blackwater Special Area of Conservation (SAC)** (Site Code: 002299). The Qualifying Interests (QIs) of this SAC are summarised as:
  - *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
  - River Lamprey (*Lampetra fluviatilis)* [1099]
  - Salmon (*Salmo salar)* [1106]
  - Otter (*Lutra lutra*) [1355]

The River Boyne and River Blackwater SAC is also designated for the presence of Alkaline fens [7230]. However, this habitat was screened out during the Stage 1 AA Screening, owing to the location of this habitat upstream of the Proposed Scheme; in the vicinity of Lough Shesk, Freehan Lough and Newtown Lough in the upper reaches of the Stonyford River, near Delvin. The Proposed Scheme does not support connectivity to this QI. Additionally, Alkaline fen habitat was not identified within the footprint of the Proposed Scheme.

- **Boyne Coast and Estuary SAC** (Site Code: 001957). The QIs of this SAC are summarised as:
  - Estuaries [1130]
  - Mudflats and sandflats not covered by seawater at low tide [1140]
  - Salicornia and other annuals colonizing mud and sand [1310]
  - Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
  - Mediterranean salt meadows (*Juncetalia maritimi*) [1410]
- **River Boyne and River Blackwater Special Protection Area (SPA)** (Site Code: 004232). The Special Conservation Interests (SCIs) of this SPA are summarised as:
  - Kingfisher (*Alcedo atthis)* [A229]
- **Boyne Estuary SPA** (Site Code: 004080). The SCIs of this SPA are summarised as:
  - Shelduck (*Tadorna tadorna)* [A048]
  - Oystercatcher (*Haematopus ostralegus)* [A130]
  - Golden Plover (*Pluvialis apricaria)* [A140]
  - Grey Plover (*Pluvialis squatarola)* [A141]
  - Lapwing (*Vanellus vanellus)* [A142]
  - Knot (*Calidris canutus)* [A143]
  - Sanderling (*Calidris alba)* [A144]
  - Black-tailed Godwit (*Limosa limosa)* [A156]
  - Redshank (*Tringa tetanus)* [A162]
  - Turnstone (*Arenaria interpres)* [A169]
  - Little Tern (*Sterna albifrons)* [A195]
  - Wetlands [A999]

2 DESCRIPTION OF THE PROPOSED SCHEME

2.1 Description of the Proposed Scheme

A detailed description of the Proposed Scheme is provided in **Chapter 4 – Description of the Proposed Scheme**, of the Environmental Impact Assessment Report (EIAR) which has been prepared as part of the application for development consent for the Proposed Scheme.

2.2 Description of Construction Phase

A description of the construction phase of the Proposed Scheme is provided in **Chapter 5: Description of the Construction Phase** of the Environmental Impact Assessment Report (EIAR) which has been prepared as part of the application for development consent for the Proposed Scheme.

2.3 Predicted Adverse Effects

The activities that have the potential to result in adverse effects on QIs and SCIs of relevant European sites are outlined in **Sections 2.3.1** and **Section 2.3.2** below.

2.3.1 Construction Phase Impacts

The potential likely significant construction phase effects identified at the Screening stage are summarised in **Table 2-1** as follows:

Table 2-1: Potential Construction Phase Impacts as a Result of the Proposed Scheme

Impact Type	Source of Impact
1. **Surface water pollution**	• Surface water run-off (i.e. silt, cement, hydrocarbons) • Accidental pollution events • Enabling works (i.e. soil stripping, vegetation removal, cut and fill and negotiation of steep slopes) • Site preparation and clearance works • Demolitions and earthworks • Stockpiling and transport of materials • Pumping of solids-contaminated water from on-site excavations • Site compound(s), working areas, access routes (permanent and temporary) and machinery/traffic • Cofferdam installation and construction • Piling to construct bridge foundations • Cofferdam removal and removal of working areas within the River Boyne floodplain • Construction of attenuation ponds, interceptor drains, culvert crossings, outfalls and other surface water drainage infrastructure • Overbridges and pedestrian/cycle bridge • Changes to downstream water flow during construction • Pre-construction Archaeology and Ground Investigation (GI) survey
2. **Air pollution**	• Dust generated during earthworks and construction activities • Vehicle-generated pollutants
3. **Groundwater quality/ yield/ flow paths**	• Earthworks • Cofferdam construction and piling • Road drainage and attenuation ponds
4. **Habitat loss**	• Cofferdam installation and construction • Piling to construct bridge foundations • Boyne Bridge crossing • Overbridges and pedestrian/cycle bridge • Re-alignment and widening of the mainline

Impact Type	Source of Impact
	• Site compound(s), working areas, access routes (permanent and temporary) and machinery • Construction of attenuation ponds • Construction of structures and hard surfaces
5. **Habitat fragmentation**	• As per Impact Type 4
6. **Habitat deterioration/ alteration**	• As per Impact Type 4 • Surface water run-off • Cofferdam removal and removal of working areas within the River Boyne floodplain • Proposed Scheme itself (change in land-use) • Incursion of human-presence • Invasive Alien Plant Species (IAPS) • Negotiation of steep slopes by construction machinery
7. **Disturbance (noise vibration, lighting, human presence)**	• Cofferdam construction and piling • Cofferdam removal and removal of working areas within the River Boyne floodplain • Excavations causing high levels of noise and vibration • Movement of plant and vehicles • Disturbance associated with the presence of construction staff • Lighting used during night working, site compounds(s), vehicles and machinery • Resurfacing, and re-organising measures associated with the public realm (e.g. construction of raised ramps and pathways) • Pre-construction Archaeology and GI survey
8. **Change in hydrological regime**	• Reno mattress and cofferdam installation • Bridge piers
9. **Barrier to connectivity**	• Proposed Boyne bridge crossing • Artificial lighting during construction
10. **Direct mortality**	• Construction compounds and open excavations.

2.3.2 Operational Phase Impacts

The potential likely significant operational effects identified at the Screening stage are summarised in **Table 2-2** as follows:

Table 2-2: Potential operational phase impacts as a result of the Proposed Scheme

Impact Type	Source of Impact
1. **Surface water pollution**	• Surface water run-off from operation of Proposed Scheme (i.e. oils/fuels, silt, heavy metals and other pollutants typical of routine road run-off) • Attenuation and retention ponds • Maintenance activities including painting, deck surfacing, attenuation pond sediment removal, sediment and oil removal of vortex grit chambers and petrol/oil interceptor cleaning • Permanent access tracks • Scaffolding to facilitate maintenance activities • Accidental pollution incidents
2. **Air pollution**	• Vehicle-generated pollutants (Proposed Scheme road users)
3. **Habitat fragmentation**	• Boyne Bridge crossing • Overbridges and pedestrian/cycle bridge • Re-alignment and widening of the mainline • Attenuation ponds
4. **Habitat deterioration/ alteration**	• Surface water run-off (i.e. oils/fuels, silt, heavy metals and other pollutants typical of routine road run-off)

Impact Type	Source of Impact
	• Proposed Scheme itself (change in land-use) • Presence of the Boyne bridge crossing (i.e. shading of river and riparian habitats) • Increased human presence and change in pattern of activity • Spread of IAPS • Attenuation ponds and culverts
5. Disturbance (noise vibration, lighting, human presence)	• Road users of the Proposed Scheme (i.e. vehicles, cyclists and pedestrians) • Movement of operational and maintenance plant and vehicles • Disturbance associated with the presence of operational and maintenance staff and structures (i.e. personnel, scaffolding) • Lighting used during operation and maintenance
6. Barrier to connectivity	• Proposed Boyne bridge crossing
7. Collision risk	• Proposed Boyne bridge crossing (bridge strike) • Proposed Scheme itself (vehicle collision)
8. Direct mortality	• Proposed Scheme itself (i.e. vehicle collision resulting in accidental killing/injury)

3 METHODOLOGY

3.1 Appropriate Assessment Guidance

Both EU and national guidance exists in relation to Member States fulfilling their requirements under the EU Habitats Directive, with particular reference to Article 6(3) and 6(4) of that Directive. The methodology followed in relation to this assessment has had regard to the following guidance:

- Office of the Planning Regulator (OPR) (2021) *Appropriate Assessment Screening for Development Management*, Practice Note PN01. Office of the Planning Regulator, Dublin 7, Ireland;
- European Commission (EC) (2021) Commission Notice. Assessment of plans and projects in relation to Natura 2000 sites – Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC. European Commission;
- NPWS (2019) *The Status of EU Protected Habitats and Species in Ireland. Habitat Assessments* Volume 2. Version 1.0. Unpublished Report, National Parks and Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland;
- NPWS (2019a) The Status of Protected EU Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished Report, National Parks & Wildlife Services. Department of Culture, Heritage and the Gaeltacht, Dublin;
- NPWS (2019b) The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished Report, National Parks and Wildlife Service. Department of Culture, Heritage and the Gaeltacht, Dublin;
- NPWS (2019c) The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments. Unpublished Report, National Parks and Wildlife Service. Department of Culture, Heritage and the Gaeltacht, Dublin;
- EC (2018) *Managing Natura 2000 Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*, Office for Official Publications of the European Communities, Luxembourg. European Commission;
- Chartered Institute of ecology and Environmental Management (CIEEM) (2018) *Guidelines for Ecological Impact Assessment in the UK and Ireland*. Chartered Institute of Ecology and Environmental Management;
- EC (2013) *Interpretation Manual of European Union Habitats*. Version EUR 28. European Commission, Luxembourg;
- NPWS (2013a) Ireland's Summary Report for the period 2008 – 2012 under Article 12 of the Birds Directive. National Parks and Wildlife Services. Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland;
- DEHLG (2009, rev. 2010) *Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities*. Department of the Environment, Heritage and Local Government;
- EC (2007) *Guidance document on the strict protection of animal species of Community interest under the Habitats Directive 92/43/EEC*. European Commission, Luxembourg;
- EC (2006) Nature and biodiversity cases: Ruling of the European Court of Justice. European Commission, Luxembourg;
- EC (2002) *Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*, Office for Official Publications of the European Communities, Luxembourg; and
- EC (2000) *Communication from the Commission on the Precautionary Principle*. Office for Official Publications of the European Communities, Luxembourg.

Recent Irish and European case law on the Habitats Directive has also influenced this NIS.

3.2 Consultation

Consultation was undertaken during the preparation of the EIAR and NIS for the Proposed Scheme. Consultation responses of relevance to the Appropriate Assessment process are summarised in **Table 3-1** below.

Table 3-1: Summary of Consultation Responses Relevant to the Appropriate Assessment Process

Consultee	Summary of Discussion / Response
National Parks and Wildlife Service December 2022 (Meeting)	• NPWS suggested further surveys/ updates to existing surveys which might be considered by the project team. • Recommended reuse of stripped ecological materials as part of the landscaping proposals. • Recommended that the quality of the woodland to the north of the river and within the SAC boundary be checked. • Queried the lighting proposals on the scheme in terms of effects on otter and salmon. • Referenced emerging Nature restoration law. • Referenced consistency with biodiversity action plan.
Inland Fisheries Ireland October 2021 (Written)	• Importance of the ecological status of the River Boyne which contains Atlantic salmon, brown trout, eels and lamprey stock within the River Boyne. • Would like AA/ EIS carried out to ensure sufficient information on potential impacts to aquatic environment. • Concern over the mechanism of construction works. • Emphasises the importance of water quality, fish spawning and nursery areas, passage of migratory fish / biological connectivity / barriers to free transition, ecosystem structure and functioning, sediment transport and alien invasive species. • Noted that Dunbia Meat Processing factory at Greenhills, Beauparc, may be constructing an effluent pipeline to the River Boyne via Dollardstown.
Geological Survey of Ireland, DCCAE December 2019 (Written)	• List of guidelines provided along with available geo-data viewers/ download links.
Development Applications Unit (DAU), Department of Culture, Heritage and the Gaeltacht March 2018 (Written)	• River Boyne and River Blackwater SAC and SPA as a nature constraint along with other Natura 2000 sites and Red Data Book species etc. • Noted that Himalayan balsam and Japanese knotweed are present along the River Boyne.
Inland Fisheries Ireland (Meeting) October 2018	• Information provided on salmonid watercourses and fish passes. • Drainage – road drainage should not be discharged on top of salmonid gravels. • Barrier removed near outlet to Boyne – salmon now access upstream and spawning. Another barrier further upstream potentially requires removal. Fish passage may be required for Proposed Scheme as part of bridge works. • Devlin's river improved in recent years to improve flow. Good lamprey potential. Salmonids present but not every year. • Penalties for polluting watercourses. Must comply with contract and environmental legislation. • Kingfisher nest noted on the Mattock Stream (however this location was outside of the Proposed Scheme mapping). • Advance works required in relation to invasive species management.

3.3 Relevant European Sites

3.3.1 Identifying Relevant European Sites

The identification of relevant European sites to be included in this assessment was based on the criteria provided in *Appropriate Assessment Screening for Development Management* (OPR, 2021), namely:

- Any European site within or adjacent to the project area; and
- Identification of the Zone of Influence (ZoI) using the Source-Pathway-Receptor model (S-P-R).

3.3.1.1 Establishing a Zone of Influence

Determination of the ZoI for the Proposed Scheme is achieved by assessing the various project elements against the ecological receptors within the Proposed Scheme footprint, in addition to all ecological receptors that could be connected to and subsequently impacted by the Proposed Scheme through abiotic and biotic vectors.

With reference to the OPR (2021) Practice Note PN01, the S-P-R model has been used to identify the ZoI to ensure that relevant European sites are identified. The S-P-R model minimises the risk of overlooking distant or obscure effect pathways, while also avoiding an over reliance on buffer zones (e.g. 15 km), within which all European sites should be considered. This approach follows the DEHLG 2010 guidance on AA which states that:

> "*For projects, the distance could be much less than 15 km, and in some cases less than 100m, but this must be evaluated on a case-by-case basis with reference to the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects*" (DEHLG, 2010; p.32, para 1).

The concept of the S-P-R model involves consideration of:

- A 'source' which is defined as the individual element of the proposed works that has the potential to impact on a European site, its qualifying features and its conservation objectives;
- A 'pathway' which is defined as the means or route by which a source can affect the ecological receptor; and
- A 'receptor' which is defined as the SCI of SPAs or Qualifying Interests (QI) of SACs for which conservation objectives have been set for the European sites being screened.

A S-P-R model is a standard tool used in environmental assessment. In order for an effect to be likely, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism results in no likelihood for the effect to occur. The S-P-R model was used to identify a list of European sites, and their QIs/ SCIs, with potential links to European sites. These are termed as 'relevant' European sites/ QIs/ SCIs throughout this report.

Following the Guidelines for Assessment of Ecological Impacts of National Roads Schemes (Rev. 2 1st June 2009) as set out by the NRA, the Proposed Scheme has been evaluated based on an identified ZoI with regard to the potential impact pathways to ecological feature (e.g. mobile and static). The ZoI of the Proposed Scheme on mobile species (e.g. birds, mammals, and fish), and static species and habitats (e.g. saltmarshes, woodlands, and flora) is considered differently. Mobile species have 'range' outside of the European site in which they are the stated QI/ SCI. The range of mobile QI/ SCI species varies considerably, from several metres to hundreds of kilometres depending on the ecology of the species being considered. Whilst static species and habitats are generally considered to have a ZoI within close proximity of the Proposed Scheme, they can be significantly affected at considerable distances from an effect source; for example, where an aquatic QI habitat or plant is located many kilometres downstream from a pollution source.

Hydrological linkages between the Proposed Scheme and European sites (and their QIs/ SCIs) can occur over significant distances; however, any effect will be site-specific depending on the receiving water environment and nature of the potential impact. As a precautionary measure, a reasonable worst-case ZoI for water pollution from the Proposed Scheme site is considered to be the surface water catchment. In this report, the surface water catchment is defined at the scale of Catchment Management Unit (CMU), as

adopted in the River Basin Management Plan (RBMP) for Ireland 2018-2021 (DHPLG, 2018). The ZoI extends into the first coastal water body.

Hydrogeological linkages between the Proposed Scheme and European sites (and their QIs/ SCIs) are highly variable based on the characteristics of the groundwater body, methodologies used, and the presence of groundwater dependant habitats and species. As a precautionary measure, a reasonable worst-case ZoI for water pollution from the Proposed Scheme site is considered to capture the entirety of each groundwater body the Proposed Scheme overlies.

3.3.2 Consideration of Adverse Effect on Integrity

The European Commission's 2018 and 2021 Notices (EC, 2018; EC, 2021) advise that the purpose of the appropriate assessment is to assess the implications of the plan or project in respect of the site's COs, either individually or in combination with other plans or projects. The conclusions should enable the competent authorities to ascertain whether the plan or project will adversely affect the integrity of the site concerned. The focus of the appropriate assessment is therefore specifically on the species and/ or the habitats for which the European site is designated.

EC (2019) also emphasises the importance of using the best scientific knowledge when carrying out the appropriate assessment in order to enable the competent authorities to conclude with certainty that there will be no adverse effects on the integrity of the site. This guidance notes that it is at the time of adoption of the decision authorising implementation of the project that there must be no reasonable scientific doubt remaining as to the absence of adverse effects on the integrity of the site in question.

The judgement of the Court of Justice of the European Union (CJEU) confirmed in its ruling in Case C-258/11 that *'Article 6(3) of the Habitats Directive must be interpreted as meaning that a plan or project not directly connected with or necessary to the management of a site will adversely affect the integrity of that site if it is liable to prevent the lasting preservation of the constitutive characteristics of the site that are connected to the presence of a priority natural habitat whose conservation was the objective justifying the designation of the site in the list of SCIs, in accordance with the directive. The precautionary principle should be applied for the purposes of that appraisal'.* EC (2019) advises that the logic of such an interpretation would also be relevant to non-priority habitat types and to habitats of species.

As regards the meaning of 'integrity', this clearly relates to ecological integrity. This can be considered as a quality or condition of being whole or complete. In a dynamic ecological context, it can also be considered as having the sense of resilience and ability to evolve in ways that are favourable to conservation.

EC (2019) notes that if the competent authority considers the mitigation measures are sufficient to avoid the adverse effects on site integrity identified in the appropriate assessment, they will become an integral part of the specification of the final plan or project or may be listed as a condition for project approval.

EC (2020) advises that it is for the competent authorities, in the light of the conclusions made in the appropriate assessment on the implications of a plan or project for the European site concerned, to approve the plan or project. This decision can only be taken after they have made certain that the plan or project will not adversely affect the integrity of the site. That is the case where no reasonable scientific doubt remains as to the absence of such effects.

EC (2020) also reaffirms that the authorisation criterion laid down in the second sentence of Article 6(3) of the Habitats Directive integrates the precautionary principle and makes it possible to effectively prevent the protected sites from suffering adverse effects on their integrity as the result of the plans or projects. A less stringent authorisation criterion could not as effectively ensure the fulfilment of the objective of site protection intended under that provision. The onus is therefore on demonstrating the absence of adverse effects rather than their presence, reflecting the precautionary principle. It follows that the appropriate assessment must be sufficiently detailed and reasoned to demonstrate the absence of adverse effects, in light of the best scientific knowledge in the field.

3.3.3 Consideration of Ex-situ Effects

EC (2019) advises that Member States, both in their legislation and in their practice, allow for the Article 6(3) safeguards to be applied to any development pressures, including those which are external to European sites, but which are likely to have significant effects on any of them.

The CJEU developed this point when it issued a ruling in case C-461/17 (Holohan and Others v An Bord Pleanála) that determined inter alia that Article 6(3) of Directive 92/43/EEC must be interpreted as meaning that an appropriate assessment must on the one hand, catalogue the entirety of habitat types and species

for which a site is protected, and, on the other, identify and examine both the implications of the proposed project for the species present on that site, and for which that site has not been listed, and the implications for habitat types and species to be found outside the boundaries of that site, provided that those implications are liable to affect the COs of the site.

In that regard, consideration has been given in this Stage 2 appraisal to inform appropriate assessment to implications for habitats and species located both inside and outside of the European sites considered in the screening appraisal with reference to those sites' COs where effects upon those habitats and/ or species are liable to affect the COs of the sites concerned.

3.3.4 Consideration of In-combination Effects

Article 6(3) of the Habitats Directive requires that in-combination effects with other plans or projects are also considered. As set out in EC (2019), significance will vary depending on factors such as magnitude of impact, type, extent, duration, intensity, timing, probability, cumulative effects and the vulnerability of the habitats and species concerned.

EC (2020) notes that cumulative environmental effects can be defined as effects on the environment caused by the combined action of past, current and future activities. Although the effects of one development may not be significant, the combined effects of several developments together can be significant.

EC (2020) also notes that the 'in combination' provision applies to plans or projects that are completed, approved but uncompleted, or proposed. In addition to the effects of the plans or projects that are the main subject of the assessment, it may be appropriate to consider the effects of already completed plans and projects. Although already completed plans and projects are themselves excluded from the assessment requirements of Article 6(3), it is still important to take them into consideration when assessing the effects of the current plan or project in order to determine whether there are any potential cumulative effects arising from the current project development in combination with other completed plans and projects.

The effects of completed plans and projects would typically form part of the site's baseline conditions at this stage. Plans and projects that have been approved in the past but have not yet been implemented or completed should be included in the in-combination provision. As regards other proposed plans or projects, on grounds of legal certainty it would seem appropriate to restrict the 'in combination' provision to plans that have been proposed, (i.e. for which an application for approval or consent has been submitted) (EC, 2020).

This mirrors the advice contained in EC (2019) which advises that other plans or projects which are completed, approved but uncompleted, or proposed should be considered. EC (2019) specifically advises that "*as regards other proposed plans or projects (i.e. other projects not proposed by the Applicant), on grounds of legal certainty it would seem appropriate to restrict the in-combination provision to those which have been actually proposed, i.e. for which an application for approval or consent has been introduced.*"

The ability for impacts arising from the Proposed Scheme to overlap with those from other projects, plans and activities to result in adverse effects are considered. This means that, in most examples, an overlap of the physical extents of the impacts arising from the two (or more) projects, plans or activities must be established for an in combination effect to arise. For example, for a cumulative sedimentation effect to be established between the Proposed Scheme and another project, it must be established that the extent of sediment release from both projects has the potential to overlap and may affect a receptor at the same location.

Exceptions to this exist for certain mobile receptors that may move between, and be subject to, two or more separate physical extents of impact from two or more projects. For example, species such as otter may be affected by water quality impacts from the project, as well as those from other projects where the extent of another area affecting water quality does not directly overlap with that of the project. Where relevant, mitigation is proposed as necessary to prevent adverse in-combination effects from occurring.

3.4 Ecological Data

3.4.1 Desk Study

This assessment was informed by a desktop study completed in April 2021 and then updated in November 2022 to assess the potential for all QIs and SCIs of European sites to occur, given their ecological requirements identified by Balmer et al. (2013) for SCIs, and the NPWS for QIs (NPWS, 2019 a, b, c). The desk study is completed to provide contextual information to inform the assessment and to inform the surveys which may be required to inform the assessment.

SCI Birds and mobile QI species can travel many kilometres from their core areas, and desktop surveys assessed the potential presence of such species beyond the European sites for which they are QIs/ SCIs. Desktop studies had particular regard to the following sources:

- EPA online interactive mapping tool;[1]
- Tabulated lists for all European sites in Ireland of SCIs and QIs, obtained through a data request to the NPWS;
- Information on ranges of mobile QI populations in Volume 1 of NPWS' Status of EU Protected Habitats and Species in Ireland (NPWS, 2019a), and associated digital shapefiles obtained from the NPWS Research Branch;
- Information on ranges of mobile SCIs bird populations from Bird Atlas 2007–11 (Balmer et al., 2013), excluding birds of prey whose ranges were determined with reference to Hardey et al. (2013);
- Mapping of European site boundaries and Conservation Objectives for relevant sites in County Dublin and beyond, as relevant, available online from the NPWS;
- Distribution records for QI and SCI species of European sites held online by the National Biodiversity Data Centre (NBDC[2]);
- Details of QIs/ SCIs of European sites within the National Biodiversity Action Plan 2017-2021 (DCHG, 2017);
- Data including surface and ground water quality status, and river catchment boundaries available from the online database of the Environmental Protection Agency (EPA[3]);
- Information on groundwater aquifers, recharge, and vulnerability available from the online database of Geological Survey Ireland (GSI);
- National and regional surveys of semi-natural habitats, including grasslands (O'Neill et al., 2013), saltmarsh (McCorry and Ryle, 2009; Devaney and Perrin, 2015), and woodland (Perrin et al., 2008); and
- Boundaries for catchments with confirmed or potential freshwater pearl mussel (FWPM) *Margaritifera margaritifera* populations in GIS format available online from the NPWS.

3.4.2 Field Study

This NIS is also informed by the findings of ecological surveys of the Proposed Scheme, carried out by professional ecologists on various dates and across multiple years between 2017 and 2023. The findings of the surveys, along with the findings of the desk studies, provide the ecological baseline against which the effects on integrity of the Proposed Scheme on the relevant European sites are determined.

The multi-disciplinary surveys assessed the potential for all QIs/ SCIs of European sites to occur, given their ecological requirements identified by Balmer *et al*. (2013) for birds, and the NBDC and NPWS for all other species/habitats (NPWS, 2019a, b, c). The surveys included checks of suitable habitats for all highly mobile QI/ SCI species potentially occurring. Species surveys had regard for relevant guidance (e.g. NRA, 2009a). A review of Ordnance Survey maps and of detailed aerial photography was also carried out to assist in delineating the extents and boundaries of different habitat types.

Habitat surveys included checks for invasive species listed in the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011, as amended, within the vicinity of the Proposed Scheme. Comprehensive bird surveys have also been undertaken.

These field surveys relevant to this NIS are summarised in **Table 3-2** below and the findings of the site visits for QIs/ SCIs for relevant European sites are provided in **Section 4** and **Appendix 1 – Natura Impact Statement Supporting Information**.

[1] Available online at: https://gis.epa.ie/EPAMaps/, Accessed November 2021-2023.

[2] Assessing records up to 10 years old (from date of search), for an area of 5 km from the Proposed Scheme site. Available online at: https://maps.biodiversityireland.ie/Map, Assessed April 2021.

[3] EPA Maps. Available online at: https://gis.epa.ie/EPAMaps/, Accessed November 2021-2023.

Table 3-2: Summary of Ecological Field-studies Completed for the Proposed Scheme

Title	Extent of Survey	Overview of survey	Survey Contractor	Date
Habitats	Footprint of the Proposed Scheme and adjoining lands	Habitat classification to Fossitt (2000)	RPS Ecology	October and December 2017; January, June, September and November 2018; June 2019; July 2020; and March 2022.
Protected and Notable Flora	Footprint of the Proposed Scheme	Assessment of potential for species listed in Flora (Protection) Order 2022, and Red Lists (Wyse Jackson et al., 2016; Lockhart et al., 2012)	RPS Ecology	
Invasive Alien Plant & Animal Species (IAPS)	Footprint of the Proposed Scheme	Identification of Third Schedule Species of European Communities (Birds and Natural Habitats) Regulations 2011 as amended	RPS	
Otter	Bankside assessment of River Boyne & Mattock (Mooretown) stream.	Assessment for evidence of holts and field signs (e.g., spraint, slides, trails, prints and couches)	RPS	June, September 2018; January 2020; August and September 2021 and April-May 2023.
	Boat survey of River Boyne (d/s Boyne Br). Surveys included 150m outside the footprint of the Proposed Scheme.			November 2018 and November 2021.
	Survey of the River Boyne to inform a proposed greenway project. Data relevant to Proposed Scheme provided to RPS.	Assessment for evidence of holts and field signs (e.g., spraint, slides, trails, prints and couches)	Atkins	May and June 2023.
Breeding Birds	Footprint of the Proposed Scheme	Identification of calls, sightings, and breeding behaviours during timed vantage points	RPS	May – July 2020; April – July 2021; and April – July 2022.
Kingfisher	Site-specific locations along the River Boyne (two sections adjacent to the proposed bridge crossing)	Identification of calls, sightings, and breeding behaviours during timed vantage points	RPS	June, September, November and December 2018; January, February, March, June and July 2019; May – July 2020; April – July 2021; and April – July 2022.
Wintering Birds	Site-specific locations as identified during the preliminary walkover	Identification of calls, sightings, and breeding behaviours during: • Timed vantage points at Hill of Slane and Slane Valley (wintering birds); • Transects (wintering farmland birds); and	RPS	November 2019 – March 2020; November 2020 – March 2021; and December 2021 – March 2022.

Title	Extent of Survey	Overview of survey	Survey Contractor	Date
		• Within the footprint and 2 km of the Proposed Scheme (Overwintering wildfowl)		
Aquatic Surveys (see Chapter 16: Biodiversity – Aquatic Ecology)	River Boyne – proposed crossing point + 500 m downstream	Instream, riparian, and floodplain habitat description- instream plant communities.	Lauren Williams	March 2022.
	Mattock (Mooretown) Stream – proposed crossing point + 200 m downstream, including adjoining drains downstream of existing N2 bridge crossing	Q-value sample and analysis- instream and riparian habitat descriptions, instream plant communities.		
	River Boyne – Slane Bridge	Q-value sample and analysis- instream habitat description.		August 2021.
	Mattock (Mooretown) Stream – proposed crossing point + adjoining drains downstream of existing N2 crossing	Q-value sample and analysis- instream and riparian habitat description.		
	River Boyne – Slane Bridge	Q-value sample and analysis- instream habitat description.		August 2020.
	Mattock (Mooretown) Stream – just downstream proposed crossing point	Q-value sample and analysis- instream and riparian habitat description.		

3.4.3 Data Limitations

3.4.3.1 Desk Study

Sources of desk study information are neither exhaustive nor necessarily easily available, and an extensive effort was made to obtain ecological data in the public domain to inform the description of the baseline environment and its assessment. Additional information, not in the public domain, is likely to exist, but could not be obtained or assessed here. This limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment.

3.4.3.2 Field Study

The receiving environment (i.e. baseline condition) may naturally vary through seasons and between years (NRA, 2009a). All reasonable effort has been made to address this (e.g. combined use of desk and field survey data), and the limitation is acknowledged. As documented in **Table 3-2**, above, many of the surveys were repeated and updated over multiple years; hence limiting the effect of variability. The limitation does not affect the certainty or predictability of the assessment.

3.4.3.3 Otter Activity

During the boat survey carried out in November 2021 to observe otter activity along the River Boyne, it was deemed unsafe by the Meath River Rescue team accompanying ecologists to vacate the boat and survey small islands within the watercourse. This was due to a combination of fast flowing water, potentially soft ground and difficult access due to a build-up of floating vegetation and timber. It was therefore not considered appropriate or safe. Every effort was made by the surveyors to ensure detailed survey of the area using close focusing binoculars. This limitation is acknowledged and incorporated into the assessment and is deemed to not affect the certainty or predictability of the assessment.

4 BASELINE DESCRIPTION

This Section details the findings of the desktop and field survey results in order to describe the relevant receiving environment of the Proposed Scheme. The relevant receiving environment relates to anything that may be directly or indirectly related to the QIs/ SCIs of relevant European sites. The Proposed Scheme has been assessed against the following baseline description.

4.1 Site of the Proposed Scheme

4.1.1 Overview

The predominant land use within the ZoI of the Proposed Scheme are pastures and agricultural land with pockets of wet grassland, freshwater marsh and mature deciduous woodland. Urban development forming part of Slane lies to the west of the Proposed Scheme.

The River Boyne flows generally in a north easterly direction before discharging into the Irish Sea near Drogheda. Upstream of the Proposed Scheme the river flows through Navan and a generally rural landscape before reaching Slane. Downstream, the river flows towards and through Drogheda, passing under the Mary McAleese Bridge at the M1 crossing, with the intervening landscape having a generally rural character.

The River Boyne is designated as both an SAC and SPA. In the vicinity of the Proposed Scheme, the boundaries of the SAC and SPA are not contiguous; rather the SPA is broadly restricted to the river channel while the SAC includes the river channel and parts of the wider floodplain; particularly to the south of the channel.

The proposed new bridge crossing to the east of Slane passes over the River Boyne, but there is no direct instream footprint as the proposed bridging structure will span both the main channel (including the SPA) and the currently disused Boyne Navigation canal. There will, however, be a construction and operational phase activities within the SAC boundary related to construction of bridge piers either side of the Boyne channel and the subsequent operation of the Proposed Scheme. The Proposed Scheme also intersects with the Mattock (Mooretown) Stream, a small tributary of the Mattock River just north of Slane; which itself is a tributary of the River Boyne and discharges into the River Boyne downstream of the proposed new bridge crossing.

4.1.2 Groundwater and Hydrogeology

According to the GSI spatial resources online mapping viewer, the Proposed Scheme is located across three groundwater bodies, namely, the Trim GWB (groundwater body) (IE_EA_G_002), the Wilkinstown GWB (IE_EA_G_010) and the Donore groundwater body (GWB) (IE_EA_G_021) [4]. The Proposed Scheme largely spans across the Trim GWB, with its northern end largely within the Wilkinstown GWB and a small southern section of the Proposed Scheme within the Donore GWB.

Trim GWB comprises a large area of limestone which is extremely heterogeneous suggesting that the degree of karstification throughout the area is highly variable. The nature of groundwater flow in this aquifer will be determined by the degree of karstification and fracturing and the purity of the limestones. In highly karstified limestone flow will be concentrated into conduits, which may draw water very deep underground. Where the limestone is less karstified the flow systems will be shallower and more diffuse. The main discharge mechanism for this aquifer is as baseflow to the River Boyne and its tributaries. Analysis of the EPA online mapper identifies this GWB as having ‘Good’ groundwater body status (2013-2018) and is ‘At Risk’ regarding meeting WFD objectives.

Wilkinstown GWB comprises of low permeability rocks with rapid groundwater flow along steep hydraulic gradients in the shallow weathered zone. Surface water and groundwater are closely linked on a local level within a short time frame with the majority of groundwater flow in this aquifer considered to take place in an upper weathered zone. Analysis of the EPA online mapper identifies this GWB as having ‘Good’ groundwater body status (2013-2018) and is ‘Not at Risk’ regarding meeting WFD objectives.

[4] GSI Spatial Resources online mapping. Available online at: https://dcenr.maps.arcgis.com/apps/MapSeries/index.html?appid=a30af518e87a4c0ab2fbde2aaac3c228.

Donore GWB is composed primarily of low permeability rocks, although localized zones of enhanced permeability do occur. In general, the majority of groundwater flow will occur in the upper 10 m, comprising a weathered zone of a few metres while groundwater will discharge to the River Boyne as it crosses the aquifer, and directly to the limestone. Groundwater movement in these rocks is expected to occur relatively rapidly and at shallow depths. Analysis of the EPA online mapper identifies this GWB as having 'Good' groundwater body status (2013-2018) and is 'Not at Risk' regarding meeting WFD objectives.

Further detail on groundwater and hydrogeology can be found in **Chapter 18 – Land, Soils, Geology and Hydrogeology**.

4.1.3 Water Quality

The most recent (2020) river monitoring results from relevant EPA river stations (RS) on the River Boyne and its Mattock tributary are provided in **Appendix 1.4**. Q-value status, as reported by the EPA, is determined by the biological quality element: macroinvertebrate fauna. The data shows impaired water quality in the vicinity of Navan, with a gradual improvement occurring over distance downstream.

The River Boyne is currently reported at 'moderate' status (Q3-4) just upstream of Slane Bridge, but 'good' status (Q4) from Slane Bridge downstream to the estuary. The Mattock is also at 'good' status (Q4) just upstream of its confluence with the Boyne at EPA River Station RS07M010300. The Mattock (Mooretown) Stream, a tributary of the Mattock River, is not individually monitored as part of the EPA river monitoring programme, but as part of the greater Mattock_030 river water body is also assigned 'good' status as part of WFD reporting. Q-value sampling as part of aquatic field studies for this project show that the Mattock (Mooretown) stream is, in fact moderately polluted and at 'poor' status in the upper reaches affected by the Proposed Scheme.

Further detail on water quality and physicochemical water quality is provided in **Appendix 1.4** of this NIS, as well as EIAR **Chapter 16 – Biodiversity: Aquatic Ecology** and **Chapter 17 – Water**.

4.1.4 Invasive Alien Plants Species (IAPS)

A search of the National Biodiversity Data Centre (NBDC) database returned records of the presence of one scheduled IAPS, namely: Himalayan Balsam *Impatiens glandulifera* (also known as Indian Balsam). The field surveys carried out on the dates listed in **Table 3-2**, also recorded the presence of Japanese knotweed *Reynoutria japonica*, Himalayan Balsam *Impatiens glandulifera* and Giant Hogweed *Heracleum mantegazzianum* within the environs of the Proposed Scheme (see **Figure 4.4**).

Giant Hogweed and several stands of Himalayan Balsam were recorded 2.5 km upstream and to the rear of Slane Castle where it borders with the River Boyne. However, no works are proposed in this area and therefore they will not be interfered with and are not considered as part of this report. Several other stands of Himalayan Balsam and Japanese Knotweed do however occur within the immediate environs of the scheme. Details of their location in relation to the Proposed Scheme are listed in **Table 4-1** below.

Table 4-1: Third Schedule IAPS Recorded During Field Surveys within the Vicinity of the Proposed Scheme

Species Name	Description	Location (ITM) Easting/Northing	Distance from Proposed Scheme
Japanese Knotweed *Reynoutria japonica*	Four stands of the invasive plant species located along track (off Fennor road) which borders with a small pond. Large patches are also noted surrounding this waterbody.	697082.44 772925.69	0.28 km west
		697083.69 772908.75	
		697085.25 772889.64	
		697098.67 772876.31	
	Suspected report provided by MCC located along the L5606 on the northern side of the road at Monknewtown.	698884.80 775957.10	1.6 km northeast

Species Name	Description	Location (ITM) Easting/Northing	Distance from Proposed Scheme
	Suspected stand located approx. 13 m from the existing N2 road along the public realm element of the scheme.	696201.53 774103.65	0.013 km northeast
Himalayan Balsam *Impatiens glandulifera*	Located along left hand bank and walking trail.	695979.25 773976.59	1.8 km u/s of proposed bridge crossing
	Located along the canal channel, approx. 150 m u/s of the existing Slane bridge.	696193.15 773721.96	0.7 km u/s of proposed bridge crossing
	Located on willow dominated vegetated island, approx. 18 m u/s of the existing Slane Bridge.	696300.76 773651.14	0.6 km u/s of proposed bridge crossing
	Located along left hand bank within bare mud.	697110.90 773185.22	0.25 km d/s of proposed bridge crossing
	Located amongst some willow trees, Noted as recently cut.	697110.94 773170.96	0.25 km d/s of proposed bridge crossing
	Located at the end of the willow stand described above along left hand bank.	697141.45 773163.10	0.29 km d/s of proposed bridge crossing
	Located under and throughout willow dominated alluvial vegetation.	697290.57 773105.01	0.45 km d/s of proposed bridge crossing
	Located along edge of left hand bank approx. 10 m northeast of the stand located beneath willow.	697310.10 773106.38	0.46 km d/s of proposed bridge crossing
	Stand located on island 1.8 m from left hand bank.	697445.86 773051.74	0.61 km d/s of proposed bridge crossing
	Located along right hand bank within vegetated willow patch.	697119.30 773269.50	0.24 km d/s of proposed bridge crossing
	Willow tree surrounded by balsam located along the right hand bank.	697614.92 773119.50	0.75 km d/s of proposed bridge crossing

4.2 European Sites likely to be impacted by the Proposed Scheme

4.2.1 Connectivity to European Sites

Connectivity between the European sites and the Proposed Scheme follows the potential source-pathway receptor model (S-P-R), which identifies the sources of likely significant effects, the pathway (land, air, hydrological, hydrogeological pathways, etc.) along which those effects that may be transferred from the source to receptor and the receptor where the effects will result in impacts on these receptors (i.e. the QI or SCI habitats and/or species of the European sites).

A number of European sites identified within the ZoI do not support pathways to the Proposed Scheme through any environmental vectors (see AA Screening under separate cover[5]). These sites included, Killyconny Bog (Cloghbally) SAC, Girley (Drewstown) Bog SAC, White Lough, Ben Loughs and Lough Doo SAC, Lough Bane and Lough Glass SAC, Mount Hevey Bog SAC, Wooddown Bog SAC, Lough Lene SAC

[5] The Stage 1 AA screening was completed in the early stages of the process. Since that time an additional European site has been notified, namely; the North-West Irish Sea SPA (site code: 004236) for which conservation objectives were published in October 2023. The new North-West Irish Sea SPA has been considered in full within this NIS.

and Raheenmore Bog SAC. Taking the characteristics and habitat requirements of the QI into account, these sites were not considered further in **Section 6**.

The Proposed Scheme does however support actual or theoretical pathways to the River Boyne and River Blackwater SAC (Site Code: 002299), Boyne Coast and Estuary SAC (Site Code: 001957), River Boyne and River Blackwater SPA (Site Code: 004232) and the Boyne Estuary SPA (Site Code: 004080). Consequently, as detailed in **Section 1.4**, these four European sites are identified to have potential likely significant effects on qualifying features of these European sites and are assessed further in this report. The spatial context of these European sites are illustrated in **Figures 4.1** and **4.2** and their QIs/SCIs summarised in **Table 4-2**.

For completeness, **Table 4-2** also considers the 2023 newly designated North-West Irish Sea SPA which was designated in October 2023.

Table 4-2: European Sites and Relevant Qualifying Interests Considered in this Assessment

Site (Code), Conservation Objectives Version & Date	Qualifying Interest (QI) Habitats and Species (*=Priority Habitat)[6]	Distance from the Proposed Scheme[7]
River Boyne and River Blackwater SAC (002299), Conservation Objectives Specific Version 1 (03/12/2021), (NPWS, 2021).	• *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0] • River Lamprey *Lampetra fluviatilis* [1099] • Salmon *Salmo salar* [1106] • Otter *Lutra lutra* [1355]	Part of the SAC within the boundary of the Proposed Scheme
Boyne Coast and Estuary SAC (001957), Conservation Objectives Specific Version 1.0 (31/10/2012), (NPWS, 2012a).	• Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • Salicornia and other annuals colonizing mud and sand [1310] • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] • Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	13.6 km east
River Boyne and River Blackwater SPA (004232), proposed works are within SAC, First Order Site-specific Conservation Objectives Version 1.0 (12/10/2022), (NPWS, 2022).	• Kingfisher *Alcedo atthis* [A229]	Part of the SPA within the boundary of the Proposed Scheme
Boyne Estuary SPA (004080), Conservation Objectives Specific Version 1.0 (26/02/2013), (NPWS, 2013b)	• Shelduck *Tadorna tadorna* [A048] • Oystercatcher *Haematopus ostralegus* [A130] • Golden Plover *Pluvialis apricaria* [A140] • Grey Plover *Pluvialis squatarola* [A141] • Lapwing *Vanellus vanellus* [A142] • Knot *Calidris canutus* [A143] • Sanderling *Calidris alba* [A144] • Black-tailed Godwit *Limosa limosa* [A156] • Redshank *Tringa tetanus* [A162] • Turnstone *Arenaria interpres* [A169] • Little Tern *Sterna albifrons* [A195] • Wetlands [A999]	13.7 km east
North-west Irish Sea SPA (004236), Conservation Objectives Specific Version 1.0 19/09/2023), (NPWS, 2023a)	• Red-throated Diver *Gavia stellata* [A001] • Cormorant *Phalacrocorax carbo* [A017] • Shag *Phalacrocorax aristotelis* [A018] • Common Scoter *Melanitta nigra* [A065]	17.8 km east

[6] Sourced from Conservation Objectives Form for each European Sites NPWS website, accessed November 2021-2023.

[7] Approximate straight-line distance from closest part of the Proposed Scheme to the closest boundary of the designation.

Site (Code), Conservation Objectives Version & Date	Qualifying Interest (QI) Habitats and Species (*=Priority Habitat)[6]	Distance from the Proposed Scheme[7]
	• Little Gull *Larus minutus* [A177] • Black-headed Gull *Chroicocephalus ridibundus* [A179] • Common Gull *Larus canus* [A182] • Lesser Black-backed Gull *Larus fuscus* [A183] • Herring Gull *Larus argentatus* [A184] • Great Black-backed Gull *Larus marinus* [A187] • Common Tern *Sterna hirundo* [A193] • Arctic Tern *Sterna paradisaea* [A194] • Little Tern *Sterna albifrons* [A195] • Great Northern Diver *Gavia immer* [A003] • Fulmar *Fulmarus glacialis* [A009] • Manx Shearwater *Puffinus puffinus* [A013] • Kittiwake *Rissa tridactyla* [A188] • Roseate Tern *Sterna dougallii* [A192] • Guillemot *Uria aalge* [A199] • Razorbill *Alca torda* [A200] • Puffin *Fratercula arctica* [A204]	

N

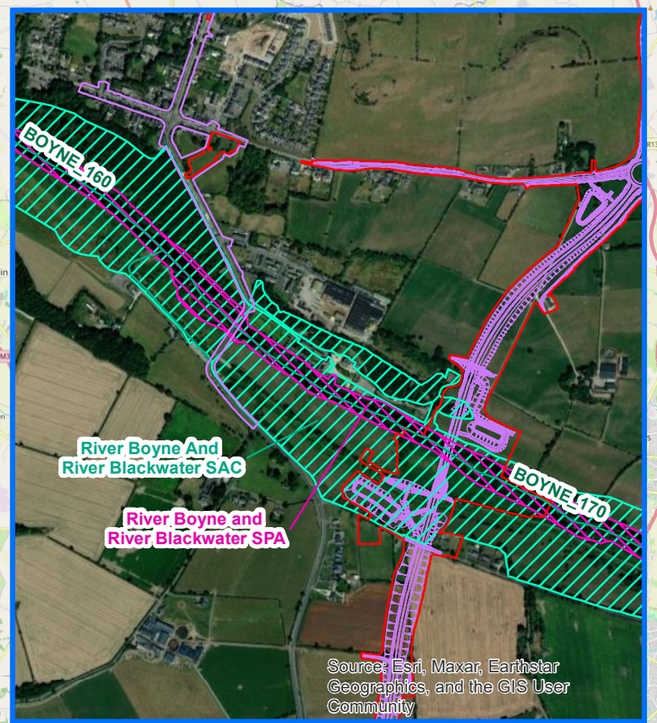
North-West Irish Sea cSPA

Boyne Estuary SPA

Boyne Coast and Estuary SAC

River Boyne And River Blackwater SAC

River Boyne and River Blackwater SPA

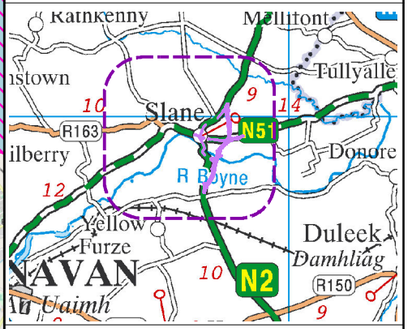


Legend

- Proposed Scheme Boundary
- Proposed Scheme
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)

Data Source: NPWS Special Areas of Conservation (2023) and Special Protection Areas (2023)
WFD River Waterbodies - Cycle 3 2023

0 2.5 5 10
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 4.1:

Relevant European Sites within the ZoI of the Proposed Scheme

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Issue Details

File Identifier: MDT0806-RPS-00-N2-DR-Z-AG-3041		
Status: A1	**Rev:** C02	**Model File Identifier:** MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
Drawn: NR		**Date:** 14/11/2023
Checked: HF		**Scale:** 1:200,000(A3)
Approved: RR		**Projection:** ITM

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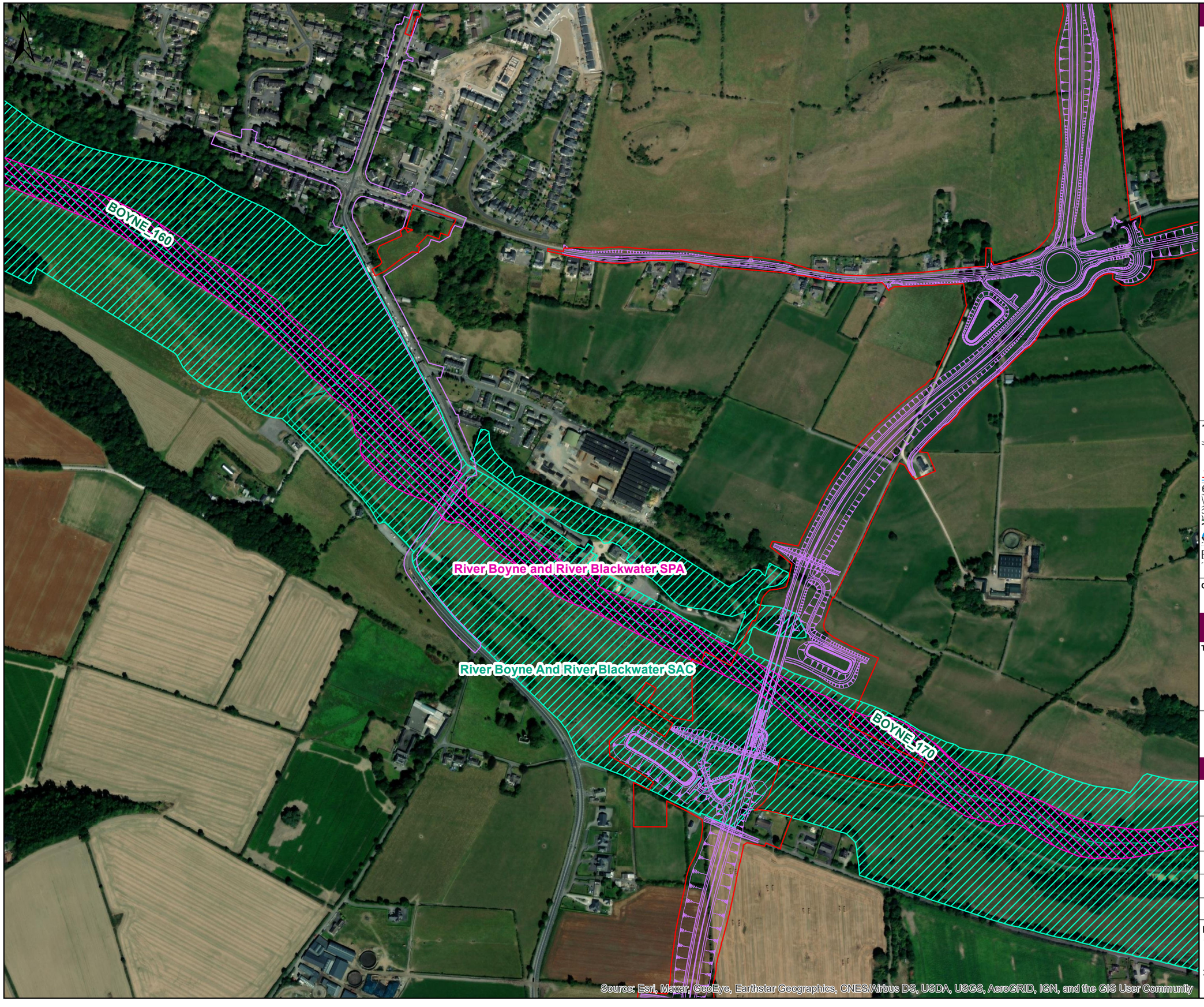


Legend

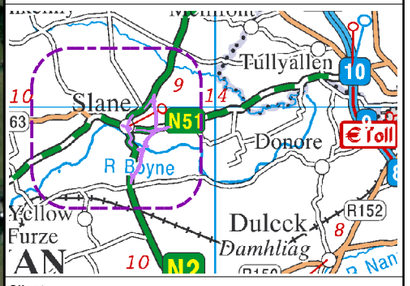
- Proposed Scheme Boundary
- Proposed Scheme

International Sites

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- River Waterbodies

Data Source: Environmental Protection Agency (EPA)
WFD River Waterbodies - Cycle 3 2021
Special Areas of Conservation 2023 (NPWS)
Special Protection Areas 2023 (NPWS)

0 0.075 0.15 0.3
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 4.2

Relevant European sites within and adjacent to the Proposed Scheme

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Issue Details

File Identifier:
MDT0806-RPS-00-N2-DR-Z-AG-3082

Status:	Rev:	Model File Identifier:
A1	C01	MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000

Drawn: NR	**Date:** 25/05/2023
Checked: HF	**Scale:** 1:6,000 (A3)
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4.3 River Boyne and River Blackwater SAC

4.3.1 Overview

According to the NPWS, the River Boyne and River Blackwater is a large, generally linear, SAC of approximately 2318 ha, which intersects the Proposed Scheme. It has three Annex II QI species and two Annex I QI habitat types (one of which is considered in this report; the other previously screened out). The SAC comprises the freshwater element of the River Boyne as far as the Boyne Aqueduct, the Blackwater as far as Lough Ramor and the Boyne tributaries including the Deel, Stoneyford and Tremblestown Rivers. These riverine stretches drain a considerable area of Meath and Westmeath, as well as smaller areas of Cavan and Louth. The underlying geology of this SAC is predominately Carboniferous Limestone, with areas of Upper, Lower and Middle well represented. Silurian Quartzite is present in the vicinity of Kells, while Carboniferous Shales and Sandstones are also present close to Trim. A number of large towns are located adjacent to but not within the SAC, including Slane, Navan, Kells, Trim, Athboy and Ballivor.

4.3.2 Alluvial Forest

The desk study did not identify and habitat with affinity to the Alluvial Forest QI habitat of the SAC within the footprint of the Proposed Scheme. However, it did identify such habitat c. 12.6 km[8] downstream of the Proposed Scheme (NPWS, 2021; see **Figure 4.3**). These islands are formed by the build-up of alluvial sediment where water movement is sluggish. The original coverage of this habitat in the local area has been significantly reduced due to historical drainage in the 1970s (NPWS, 2014a). The field surveys completed to inform the assessment of the Proposed Scheme did not identify any habitat with affinities to this QI habitat within or adjacent to the footprint of the Proposed Scheme. A full list of habitat descriptions can be found in **Chapter 15 – Biodiversity: Terrestrial Ecology** of the EIAR.

Alluvial forest is a surface water dependent habitat and is largely a function of hydrological flow regimes, the various disruptions associated with such regimes and erosion and sediment cycles that alter soil paedogenesis processes (Saint-Laurent et al., 2019). This habitat is connected through surface water flow of the River Boyne and Blackwater. The Proposed Scheme will not cause any direct loss of this habitat, however as the Proposed Scheme is located upstream of this habitat and is proposed within the floodplain of the River Boyne and River Blackwater SAC, this habitat is at risk of both impacts from water pollution (i.e. sedimentation and nutrient release), changes in water flow during construction and the spread of invasive alien plant species (IAPS).

4.3.3 River Lamprey

Juvenile lamprey (*ammocoete*) distribution was surveyed in the Boyne catchment in 2005 (O'Connor, 2006); electrofishing of suitable lamprey nursery habitat (silt deposits) was used, which found undifferentiated *Lampetra* spp. larvae present at varying densities throughout the catchment. The highest density was recorded on the Lower Boyne at the existing N2 Slane Bridge (79.00 m^{-2}), with a high density also found on the Mattock River at New Bridge (38.00 m^{-2}). The study concluded that, in the historically undrained reach of the Boyne between Drogheda and Navan, populations of both *Lampetra planeri* (brook lamprey) and *Lampetra fluviatilis* (river lamprey) were well above favourable conservation status and *Petromyzon marinus* (sea lamprey) may also be present.

In summary, River lamprey (*Lampetra fluviatilis*) are highly likely to be present in the River Boyne in the ZoI of the proposed scheme, although the species is subject to the threats of existing impaired water quality and presence of large weirs that can present an upward migration barrier to river lamprey.

Baseline aquatic surveys noted the supporting habitat (sandy sediment deposits) within the River Boyne and the presence of juvenile lamprey during a kick sample approx. 600 m upstream of the Proposed Scheme at Slane bridge.

[8] Measured as the approximate length of the main channel of the Boyne River rather than as a straight-line measurement.

4.3.4 Salmon

Whilst the River Boyne was previously one of the most salmon prolific rivers on the East coast, with c.10,000 salmon running the system in the 1980s, this has since dramatically declined. The theoretical Conservation Limit (CL)[9] set for the River Boyne by the SSCS[10] is currently 10,242 salmon per annum. In 2020 and 2021 the Boyne fish counters (located in Navan) showed deficits of -7,840 and -7,776 fish, respectively, meaning only 24% of the CL was achieved in both years (Gargan et al. 2021, 2022). The river therefore continues to be managed as catch & release-only for salmon. IFI staff estimate that approximately 300 salmon are caught and released downstream of Slane each year, many of them close to the proposed bridge crossing in the townland of Crewbán (Kevin O'Brien IFI *pers. comm*). In summer when the water is low the best of the salmon fishing is located between Slane and Oldbridge. Good numbers of salmon are taken annually during the months of July, August and September on the fisheries downstream of Slane Village. Sea trout are mainly concentrated near Oldbridge, but can be caught as far upstream as Slane, with a small run of large sea trout at the end of May and into June[11]. The best of the fishing is from the end of June to the end of September.

The SAC site synopsis (NPWS, 2014) highlights the importance of the Boyne in that it represents an eastern river which holds large three-sea-winter salmon (20-30 lb) which generally arrive in February. Smaller spring fish (10 lb) arrive in April/May; grilse come in July and a further run of fish occurs in late August (NPWS, 2014). The fishing season is 1 March to 30 September.

An extensive arterial drainage scheme was undertaken in the Boyne catchment by the OPW from 1969 to 1986 which affected virtually the entire catchment upstream of Navan. Removal of impassable weirs as part of that drainage scheme inadvertently increased potential salmonid production capacity within the system (O'Grady 2006), although subsequent water quality pressures, such as peat extraction and lake eutrophication in the upper tributaries, had significant negative ecological impacts on the system (O'Grady 1998, cited in O'Connor 2006). The Boyne main channel between Drogheda and Navan (including Slane) was never drained but retains a number of weirs that may restrict salmon movement to some extent.

Fisheries surveys have been undertaken by IFI on the Boyne and its tributaries on a number of occasions between 2009 and 2016 as part of the WFD Fisheries Monitoring programme (Kelly et al., 2010, 2013, 2014, 2015, 2017). At the few locations salmon were recorded, i.e., Athboy (2009, 2012, 2016) and Blackwater (Kells) (2009, 2013), densities were small and declined over time.

IFI also conduct surveys under the Salmon Conservation Fund throughout the Boyne catchment to assess distribution and abundance of salmon fry to inform fisheries management. A total of 142 sites were electrofished in 2020 with mean fry/5min values of 10.36 for trout and 14.94 for salmon (IFI, 2020). The highest number of salmon fry was 109 (128 fry/5min), located in the main channel of the Mattock River. A River Boyne site, 1.5 km upstream of Slane Bridge, recorded low numbers of salmon fry (1.41/5 min). In general, the main channel and larger tributaries had fewer fry compared to the smaller, more headwater, tributaries in the upper system. The overall picture of the Boyne catchment from Slane upstream is one of modest-to-poor salmon production, with barriers (weirs), drainage and impaired water quality likely to be limiting factors.

Spawning sites for Atlantic salmon are confined principally to the Boyne tributaries upstream of Slane, as there are very limited gravel deposits in the main channel (O'Grady 1998). The Boyne main channel in the downstream ZoI of the project likely acts as nursery for salmon parr, that have dropped down from tributaries and can hold station in the faster water of the main channel. Salmon likely spawn and nursery in the Mattock River >4 km downstream of the Proposed Scheme. The main channel of the Boyne in the proposed bypass crossing reach is primarily a migration route for upstream and outward going salmon.

4.3.5 Otter

A national otter survey of Ireland was carried out in 2010-2012 found that otter incidence in the Boyne catchment declined significantly by 37.3% from 1980-81 to 2004-05 and then increased by an estimated 42.8% by 2010-11 (Reid et al., 2013). The Irish population is also listed as being of Least Concern in the

[9] Scientifically derived sustainable stock level i.e. the number of returning salmon that would be required to maintain the carrying capacity of the system based on its accessible area of fluvial habitat.

[10] Standing Scientific Committee on Salmon

[11] Salmon and sea trout fishing on the River Boyne https://fishinginireland.info/salmon/east/boyne/, Accessed April 2022.

'*Ireland Red List No. 12: Terrestrial Mammals*' (Marnell et al., 2019) due to certain population recoveries in recent years. However, the Red List still identifies the Irish population as being of international importance.

Otters are rarely found far from freshwater; particularly linear habitats such as the River Boyne and its tributaries. Otters are known to occur within the Boyne Valley and can be found throughout the River Boyne and River Blackwater SAC (NPWS, 2014). They are generally active along the section of the River Boyne intersected by the Proposed Scheme. The home range of an adult otter varies widely, depending on the quality of foraging habitat, food supply and other resources. Foraging activity typically occurs nocturnally at dawn or dusk. Male otters have been known to travel up to 30 km overnight in search of food or potential mates (Woodroffe, 2001). One study in Wales found that the home range of male otters averaged 32 km, but may be as long as 80 km, while female ranges averaged 20 km (Kruuk, 1995). The average distribution density of otters is approximately one otter per 10 km on many Irish watercourses (NRA, 2009a).

Desk study results returned eighteen records of the mammal during 2018 within 5 km of the Proposed Scheme. During field surveys, no otter sightings or the presence of confirmed resting/breeding sites were found within or immediately adjacent to the footprint of the Proposed Scheme. The closest confirmed otter hold was identified during 2023 during an otter survey being completed to inform a separate proposed greenway project; this was located c. 1.3k upstream of the Proposed Scheme. Despite the absence of holts, evidence of otter activity was found both upstream and downstream of the Proposed Scheme (see **Figure 5 in Appendix 1.4**). This evidence included spraints, slides, prints and possible couching sites. This indicates that there is regular otter activity along the section of the River Boyne intersected by the Proposed Scheme; which is unsurprising given the habitat availability for otter; including availability of prey items.

4.4 River Boyne and River Blackwater SPA

The River Boyne and River Blackwater SPA, which intersects the Proposed Scheme, is a large and linear site that comprises extensive stretches of the River Boyne and its tributaries. The majority of this site is located in Meath, but it also extends into Cavan, Louth and Westmeath. This site is designated for one Annex I SCI species, namely kingfisher (*Alcedo atthis*). The species typically nests in holes within suitable banks along watercourses which can also provide sufficient and suitable foraging resources which are captured from perches above the watercourse.

Table 4-3 provides more recent information regarding the BOCCI status of kingfisher as per Gilbert *et al.* (2021). The table also details species data recorded during the I-WeBS period 2011/12-2015/16. Population changes for the SCI species, and All-Ireland and International threshold are not available for this species from Lewis et al. (2019).[12] Details on the individual numbers of SCI species recorded during the project-specific surveys are detailed below.

Table 4-3: Current BOCCI Status and I-WeBS data for SCI birds of the River Boyne and River Blackwater SPA

Special Conservation Interests	BoCCI Category[13]	Number of records 2009/10 - 2015/16	Number of seasons recorded 2009/10 - 2015/16	Number of sites 2011/12 - 2015/16	Peak Count 2011/12 - 2015/16
Kingfisher	Amber	385	7	69	12

The SPA is known to support a nationally important population of Kingfishers. Previous surveys along the river recorded 20-22 territories in 2008 and 19 pairs in 2010 (Cummins et al., 2010). According to Boag (1982), the availability of suitable nesting banks is one of the most limiting factors with regards to the presence or absence of kingfishers. Although the Boyne had high numbers of kingfisher territories per kilometre, Cummins et al. (2010) reported that it had fewer suitable banks than some rivers which had lower numbers. Other factors such as water quality, availability of suitable perches and adequate fish populations are also important in determining the overall habitat suitability of river systems for the species (Cummins et al., 2010).

As part of the field surveys completed to inform the assessment of the Proposed Scheme, kingfisher surveys were completed to determine site usage of the footprint of the Proposed Scheme by the species. Surveys

[12] https://www.npws.ie/sites/default/files/publications/pdf/IWM_106_Irelands_Wintering_Waterbirds.pdf

[13] Status as per Gilbert *et al.* (2021), superseding Colhoun & Cummins (2013).

were conducted during 2018, 2019, 2020, 2021 and 2022 breeding season. The 2018 and 2019 surveys were completed during the early stages of scheme design while the later surveys were completed specifically with respect to the Proposed Scheme.

As part of the dedicated surveys competed to inform the Proposed Scheme, a total of four visits were carried out across each of the breeding seasons (2020-2022) for the purposes of surveying and recording breeding kingfisher. Survey visits were made in the early morning to coincide with the peak period of bird activity and kingfisher seen or heard in the survey area and immediate environs were recorded, including those in flight. Methodologies used for kingfisher surveys are described in detail in **Appendix 1.1 – Ecological Surveys for Breeding Birds**.

During field surveys, it was identified that there is no optimal vertical soft-substrate nesting habitat for kingfisher within or immediately adjacent to the footprint of the Proposed Scheme. Some suitable nesting habitat was noted c. 0.42 km upstream however there was no evidence of kingfisher nesting was found in this location.

In 2018 a walkover was completed at 'route selection stage' for the Proposed Scheme. No kingfisher nesting habitat was confirmed although commuting and/or perching was noted both up and downstream of the proposed route options.

In 2019, three visits were conducted during the breeding season. Various records of kingfisher were observed, both upstream and downstream of the Proposed Scheme with a juvenile recorded on 30th June 2020. All observations related to either commuting, foraging or perching behaviour.

In 2020, a breeding location was confirmed, c. 0.40km from the public realm element of the scheme and c. 1.6 km upstream of the proposed new bridge crossing (**see Figure 2 of Appendix 1.1**). The breeding location has not been active during subsequent surveys and no new breeding locations have since been identified.

In 2021, no observations of kingfisher were made in either dedicated kingfisher surveys, breeding bird surveys or casual observations. However, during 2021 wintering bird surveys three records of the bird were noted between January and March along the River Boyne.

Separately, anecdotal evidence from a number of locals who regularly walk the river and the group leader of a kayak group, who was on his fourth journey down the Boyne from to Stackallen to Slane in two weeks, there have been no sightings of kingfisher in the Slane area in 2021. It was noted however, that in the past kingfisher had regularly been seen approx. 600 m upstream of the location of the Proposed Scheme.

In 2022, a total of twelve kingfisher flights were recorded and a territory was held across the season at Slane Demesne, approximately 0.13km upstream from the 2020 breeding site. However no breeding was confirmed. Survey evidence suggests that kingfisher are likely using the area for foraging and commuting purposes and occasional but sporadic breeding.

4.5 Boyne Coast and Estuary SAC

Boyne Coast and Estuary SAC is a 629 ha coastal site located approximately 13.6 km[14] east of the Proposed Scheme. It comprises most of the tidal sections of the River Boyne, intertidal sand- and mudflats, saltmarshes, marginal grassland, and the stretch of coast from Bettystown to Termonfeckin that includes the Mornington and Baltray sand dune systems. This coastal complex supports good examples of nine[15] Annex I QI habitat types (five of which are assessed in this report), including one which is listed with priority status.

The Boyne Coast and Estuary SAC supports primarily tidal habitats as described above. The River Boyne is the main freshwater watercourse which discharges directly into the SAC. The habitats considered relevant to this assessment include:

- Estuaries;
- Mudflats and sandflats not covered by seawater at low tide;

[14] Measured as a straight-line measurement.

[15] The Boyne Coast and Estuary SAC conservation objectives document lists eight habitat as qualifying interests, which excludes Annual vegetation of drift lines [1210] and includes Mediterranean salt meadows (*Juncetalia maritimi*). However as the NPWS website, lists Annual vegetation of drift lines on the landing page for this SAC (and excludes Mediterranean salt meadows), both habitats have been included on a precautionary basis (https://www.npws.ie/protected-sites/sac/001957).

- *Salicornia* and other annuals colonizing mud and sand;
- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); and
- Mediterranean salt meadows (*Juncetalia maritimi*).

They are considered relevant since any pollutants arising from the Proposed Scheme (e.g. sediments, cement, hydrocarbons and other chemicals) could theoretically, and with time, discharge into these downstream habitats and contribute to an affect upon their function, quality and their ability to support other species. It is considered that such a risk of an affect from the Proposed Scheme is, at most, low due to the distance of the Proposed Scheme from the receptors, the dilution effects likely to be excerpted on any pollutants over such a distance and the dynamic function of the estuary particularly with respect to the receiving, mobilisation and deposition of slits as part of its natural function. In addition, it is considered that a very significant and persistent pollution event would have to occur during the construction or operation of the Proposed Scheme to excerpt a detectable effect on those downstream habitats of the SAC. However, a precautionary approach has been adopted for the purposes of this assessment.

The habitats not considered relevant include:

- Annual vegetation of drift lines [1210];
- Embryonic shifting dunes [2110];
- Shifting dunes along the shoreline with Ammophila arenaria (white dunes) [2120]; and
- Fixed coastal dunes with herbaceous vegetation (grey dunes) [2130].

The aforementioned relevant coastal habitats form a significant resource for various birds, mammals and other species for feeding, breeding and resting (NPWS, 2019b). As dynamic habitats that support various vegetation compositions they are characterised by fine silts and sediments which are most often associated with rivers while also depending upon processes of erosion, sedimentation and colonisation by saline-tolerant organisms. Threats to these habitat types include the spread of invasive species, sedimentation (siltation rate changes) and water pollution (see **Section 5.2.2**).

4.6 Boyne Estuary SPA

4.6.1 Overview

According to the NPWS, the Boyne Estuary SPA is a 593.4 ha coastal site. It is located east of Drogheda on the border of Co. Louth and Co. Meath, approximately 13.7 km east of the Project. This SPA comprises most of the estuary of the Boyne River. Intertidal flats are present along the sides of the channelled river, parts of which are fringed by salt marshes. The sediments vary throughout the river, with innermost sheltered areas comprised of fine muds, and sandy muds or sands present towards the mouth of the river. The Boyne Estuary SPA is a highly important site for its wetland habitat and wintering waterfowl. Species which have populations of national importance here include Sanderling *Calidris canutus* (supports 7% of the national total) and Golden plover *Pluvialis apricaria* (supports 4% of the national total). Breeding populations of Little tern *Sterna albifrons* have been recorded at Boyne Estuary since at least 1984 and are also a qualifying interest for this site (NPWS, 2015).

4.6.2 SCI birds

The Conservation Objectives Supporting document for Boyne Estuary SPA (NPWS, 2012b) provides a review of the site conservation condition and population trends for Boyne Estuary SPA with regard to species' all-Ireland and international trends (**Table 4-4**). All-Ireland trends follow Lynas et al. (2007) while international trends follow Wetlands International (2006). The Birds of Conservation Concern in Ireland (BoCCI) status is also presented. **Table 4-4** also shows the relationship between a species' site trend and the current all-Ireland trend for the specified time period 1994/95 to 2008/09.

The colour coding represents the following cases:

Colour Coding	Meaning
Green	Species whose populations are stable or increasing at both site level and all-Ireland level
Beige	Species whose populations are declining at both site level and all-Ireland level. Therefore there is a potential for factors at a larger spatial scale to be influencing the observed trend at site level
Orange	Species whose populations are exhibiting an intermediate (1 - 25%) decline at site level but are stable or increasing at all-Ireland level
Pink	Species whose populations are exhibiting a moderate (25 – 49%) decline at site level but are stable or increasing at all-Ireland level
Red	Species whose populations are exhibiting severe decline (>50%) decline at site level but are stable or increasing at all-Ireland level

In the case of pink and red categories, they highlight where populations are stable at all-Ireland level, but where significant declines are seen at site level. In these cases, it would be reasonable to suggest that site-based management issues may be responsible for the observed declining site population trends (Leech et al., 2002).

Table 4-4: Non-breeding SCI Species of the Boyne Estuary SPA – Conservation Condition

Special Conservation Interests	BoCCI Category[16]	Site Conservation Condition[17]	Current Site Trend 12 Yr[18]	All-Ireland Trend[19]	International Trend[20]
Golden Plover	Red	Favourable	+35.7	-2.2	Decline
Knot	Red	Favourable	+80.1	-2.91	Decline
Black-tailed Godwit	Red	Favourable	+21.0	+70.2	Increase
Turnstone	Amber	Unfavourable	-31.6	+16.1	Decline
Shelduck	Amber	Favourable	+39.0	+4.46	Stable
Oystercatcher	Red	Favourable	+7.7	+23.5	Decline
Grey Plover	Red	Favourable	+64.0	-33.1	Decline
Lapwing	Red	Unfavourable	-45.9	-40.12	Decline
Sanderling	Green	Favourable	+366.8	+109.3	Stable/Increase
Redshank	Red	Intermediate (Unfavourable)	-1.0	+22.7	Stable/Decline

Note: Those SCIs shown on Table 5-12 without colouration are exhibiting trends which do not fit into any of the colour coded categories listed above.

The Conservation Objectives supporting documents do not provide data for breeding SCI species for the Boyne Estuary SPA. However, **Sections 4.5** and **4.6** provides the relevant field survey data gathered for SCI species of Boyne Estuary SPA associated with the Proposed Scheme. **Table 4-5** provides more recent information regarding the BOCCI status as per Gilbert *et al.* (2021) of SCI species. The table also details the percentage population changes and All-Ireland and International threshold figures for wintering SCI waterbirds in Ireland sourced from Lewis et al. (2019).[21]

[16] Birds of Conservation Concern in Ireland 2020–2026. Available online at: https://birdwatchireland.ie/app/uploads/2021/04/BOCCI4-leaflet-2-1.pdf

[17] The threshold levels of >25.0% and >50.0% follows standard convention used for waterbirds (e.g. Lynas et al. 2007; Leech et al. 2002). The 'Intermediate' range (1.0% - 24.9% decline) allows for natural fluctuations and represents a range within which relatively small population declines have the potential to be reversible and less likely to influence conservation status in the long-term (Leech et al. 2002). Declines of more than 25.0% are deemed of greater ecological significance for the long-term.

[18] Site population trend analysis: 12 yr = 1994–2007.

[19] All-Ireland trend calculated for period 1994/95 to 2008/09.

[20] International trend after Wetlands International (2006).

[21] Population changes and threshold figures as per Lewis et al. (2019). Available online at: https://www.npws.ie/sites/default/files/publications/pdf/IWM_106_Irelands_Wintering_Waterbirds.pdf

Table 4-5: Current BOCCI Status and Threshold Figures for SCI Birds of the Boyne Estuary SPA

Special Conservation Interests	BoCCI Category[22]	% Population Change/Trend				All-Ireland Threshold	International Threshold
		5 year	12 year	22 year	Historical		
Golden Plover	Red	-9.7	-52.6	-43.4		920	9,300
Knot	Red	-48.5	-32.2	-39.7	-30.3	160	5,300
Black-tailed Godwit	Red	+3.0	+29.8	+77.7	+135.0	200	1,100
Turnstone	Amber	-31.2	-31.3	-21.0	-16.4	95	1,400
Shelduck	Amber	-9.9	-17.3	-23.0	-16.4	100	2,500
Oystercatcher	Red	-21.5	-28.0	+21.5	-7.2	610	8,200
Grey Plover	Red	-42.4	-40.5	-61.8	-24.8	30	2,000
Lapwing	Red	-14.0	-52.0	-67.6	-58.4	850	72,300
Sanderling	Green	-14.1	-0.1	+91.8	+234.4	85	2,000
Redshank	Red	-2.5	-13.7	+11.2	+2.3	240	2,400[23]/760[24]

The Boyne Estuary is the second most important estuary for wintering birds on the Louth-Meath coastline. The SCI bird species relevant to this assessment, their habitat preferences, their known foraging behaviours/ranges and whether or not they are likely to occur within the footprint of the Proposed Project or theoretically affected by any downstream effects generated by the construction and/or operation of the Proposed Scheme are listed in **Table 4-7** below. In relation to downstream effects, these relate to any pollutants arising from the Proposed Scheme (e.g. sediments, cement, hydrocarbons and other chemicals) which could theoretically, and with time, discharge into habitats of the SPA and contribute to an affect upon their function, quality and their ability to support other species; including the SCI species of the SPA. It is considered that such a risk of an affect from the Proposed Scheme is, at most, low due to the distance of the Proposed Scheme from the receptors, the dilution effects likely to be excerpted on any pollutants over such a distance and the dynamic function of the estuary particularly with respect to the receiving, mobilisation and deposition of slits as part of its natural function. In addition, it is considered that a very significant and persistent pollution event would have to occur during the construction or operation of the Proposed Scheme to excerpt a detectable effect on those downstream habitats of the SPA and a knock-on effect on the SCI species that they support. However, a precautionary approach has been adopted for the purposes of this assessment.

4.6.3 Breeding bird surveys

Breeding bird surveys were conducted by RPS to determine site usage of the Proposed Scheme by SCI bird species; other than for kingfisher which was addressed specifically with respect to the River Boyne and Blackwater SPA (as detailed above).

Surveys were conducted within the footprint of the Proposed Scheme across the 2020, 2021 and 2022 breeding season. As part of the dedicated surveys competed, a total of four visits were carried out across each of the breeding seasons (2020-2022) for the purposes of surveying and recording breeding birds. Survey visits were made in the early morning to coincide with the peak period of bird activity and all species seen or heard in the survey area and immediate environs were recorded, including those in flight. The methodology employed for breeding bird surveys was a scaled down version of the British Trust for Ornithology's (BTO) Common Bird Census (CBC) methodology (Bibby *et al.*, 2000 & Gilbert *et al.*, 1998), which aims to capture breeding bird activity within the survey area. Detailed methodologies used for breeding bird surveys are described in detail in **Appendix 1.1 – Ecological Surveys for Breeding Birds**.

[22] Status as per Gilbert *et al.* (2021).

[23] *robusta*, Iceland, Faroe Islands.

[24] *totanus*, Britain & Ireland.

During the surveys completed over three consecutive years, no SCI species (other than kingfisher) were confirmed breeding within or immediately adjacent to the footprint of the Proposed Scheme. This includes all of the SCI species of the Boyne Estuary SPA.

4.6.4 Wintering bird surveys

Wintering bird surveys were conducted by RPS to determine site usage of the Proposed Scheme by SCI bird species, including those SCI species of the Boyne Estuary SPA. Surveys were conducted across the 2019/2020, 2020/2021 and 2021/2022 winter season.

As part of the dedicated surveys competed, five visits were carried out across the 2019/2020 winter season and four visits were carried out across the 2020/2021 and 2021/2022 winter season for the purposes of surveying and recording wintering birds (including farmland birds and waterfowl).

In the absence of guidance on vantage point (VP) survey protocols for the Republic of Ireland, guidance developed by Scottish Natural Heritage (SNH) for onshore wind farm ornithology surveys was followed (SNH, 2017). A total of 22 VP surveys were undertaken in the 2019/20 survey period, 24 VP surveys were undertaken in 2020/21 and 16 VP surveys were undertaken in 2021/22.

The methodology employed for wintering farmland bird surveys was based on the BTO's CBC technique (Bibby *et al.*, 2000 & Gilbert *et al.*, 1998), which aims to capture overwintering bird activity within a site. Five visits were carried out across the 2019/2020 winter season, four visits across the 2020/2021 winter season, and four visits across the 2021/2022 winter season for the purposes of surveying wintering farmland birds.

The methodology for overwintering wildfowl surveys was based on the BTO's wetland bird survey (WeBS) and BirdWatch Ireland's I-WeBS Core Counts which use the so-called 'look-see' method (Bibby *et al.,* 2000 and BirdWatch Ireland), whereby the observer, familiar with the species involved, surveys the whole of a predefined area. Ten visits were carried out across the 2019/2020 winter season, nine visits across the 2020/2021 winter season and four visits were carried out across the 2021/2022 winter season for the purposes of surveying overwintering wildfowl.

Detailed methodologies used for wintering bird surveys are described in detail in **Appendix 1.2 – Ecological Surveys for Wintering Birds**). The results of the wintering birds surveys, as relevant to the SCIs of this SPA, are summarised in **Table 4-6** below. Species recorded of relevance to the Boyne Estuary SPA are northern Lapwing and golden plover for the reasons detailed in **Table 4-4**.

Table 4-6: Relevant Wintering Bird Survey Results – Boyne Estuary SPA

SCI Species Name	Date of Survey	Flock size	Location
Vantage Point Survey			
2019/2020			
Northern Lapwing	27.11.2019	8	VP2- Flew south, above ground level (AGL) 40 m
	08.01.2020	26	VP1- Flock flew WSW over Boyne and beyond
	03.03.2020	12	VP1- 40m AGL
Golden Plover	13.02.2020	12	VP1- Flew NNE over valley and Norris Hill 80-150m AGL
	16.03.2020	8	VP1- 40-60m AGL
2020/2021			
Northern Lapwing	03.11.2020	8	VP1- Flew SSE from south of river towards McGrudders Cross
	20.11.2020	8	VP2- Flying west
	24.11.2020	6	VP1- Flock heading SSW over Norris Hill, heading towards McGrudders Cross
	15.12.2020	1	VP2- Roosting in field on northern bank at proposed crossing point
	18.12.2020	12	VP1- Flying towards McGrudders Cross

SCI Species Name	Date of Survey	Flock size	Location
	30.01.2021	17	VP1- Flying SSW approx. 2 km south
2021/2022			
n/a	n/a	n/a	n/a
Wintering Farmland Bird Survey			
2019/2020			
n/a	n/a	n/a	n/a
2020/2021			
Northern Lapwing	09.11.2020	9	Site of the Proposed Scheme
	28.01.2021	30	Site of the Proposed Scheme
	18.02.2021	4	Site of the Proposed Scheme
2021/2022			
n/a	n/a	n/a	n/a
Overwintering Wildfowl Survey			
2019/2020			
Northern Lapwing	27.11.2019	29	McGruder's Cross
	16.12.2019	19	McGruder's Cross
	09.01.2020	38	McGruder's Cross
Golden Plover	16.12.2019	6	McGruder's Cross
	29.01.2020	19	McGruder's Cross
2020/2021			
Northern	27.11.2020	18	Rossnaree
	03.12.2020	23	Crewbane
	09.12.2020	32	McGruder's Cross
	09.12.2020	11	McGruder's Cross
	04.01.2021	27	McGruder's Cross
	04.01.2021	40	Higginstown
	04.01.2021	26	Taylor's Lane
	11.01.2021	26	Thurstianstown
	11.01.2021	25	Taylor's Lane
	19.02.2021	28	Mooretown
Golden Plover	09.12.2020	12	Crewbane
2021/2022			
n/a	n/a	n/a	n/a

Table 4-7: Habitat Preferences, Foraging Range and likely occurrence of SCI Birds of the Boyne Estuary SPA in relation to the Proposed Scheme

Species Name	Habitat Preference	Status (Breeding and/or Wintering) / Foraging Details	Likely Occurrence within the ZoI of the Proposed Scheme?	Likely Occurrence Downstream of the Proposed Scheme?	Ability to Utilise Other/Alternative habitats[25] (NPWS, 2012b)	Noted During Field Surveys?
Shelduck *Tadorna tadorna* [A048]	Resident and winter migrant to sheltered estuaries or tidal mudflats. Breeds in open areas along seashores, larger lakes and rivers. Nest in holes in banks, trees, occasionally strawstacks or buildings. Increasing displacement to inland sites.	**Status**: Wintering (non-breeding). Foraging behaviour/distribution is related to their favoured prey, *Hydrobia ulvae* (Bryant & Leng, 1975; Murphy et al., 2006) which occurs in intertidal habitat.	No. Based on its habitat preference this species would occur within intertidal habitat, of which it is dependant for its food source. Shelduck also nest in terrestrial burrows and holes such as trees, crevices and old rabbit burrows, however they will be found in close proximity to the coast along sandy shores and coastal lagoons.	**Yes.** Supporting intertidal/estuarine habitat for foraging and roosting available downstream of the Proposed Scheme.	3	✗
Oystercatcher *Haematopus ostralegus* [A130]	Resident & winter visitor to all coastal habitats, and particularly favour open sandy coasts. Nests principally on shingle beaches, dunes, salt marshes and rocky shores around the coast.	**Status**: Wintering (non-breeding). Forage primarily on tidal flats although the species can be found foraging along non-estuarine coastline or terrestrially, where they eat earthworms. One study also found the longest oystercatcher foraging trip was almost 6 km from the high tideline. However, this was in contrast with observations of 200-500 m distances in another study (Schwemmer et al., 2016).	No. Although there is potential for this bird to occur within agricultural fields, any such occasional feeding would be close to coastal habitat. The Proposed Scheme is also much beyond the known foraging distances for the species. In terms of its ability to use other habitats, this species would likely use those in proximity to coastal habitat (i.e. within 6 km).	**Yes.** Supporting intertidal/estuarine habitat for foraging and roosting available downstream of the Proposed Scheme.	2	✗
Golden Plover *Pluvialis apricaria* [A140]	Widespread distribution during wintering in coastal and inland habitats. Summer populations	**Status**: Wintering (non-breeding). Forage primarily within agricultural grassland and arable land. Tidal flats are used more	**Yes.** The immediate surrounding area of the Proposed Scheme supports preferred habitat types for this species (i.e. grassland and arable land). Furthermore,	**Yes.** Supporting intertidal/estuarine habitat for roosting available downstream of the Proposed Scheme. Often favour the	2	✓

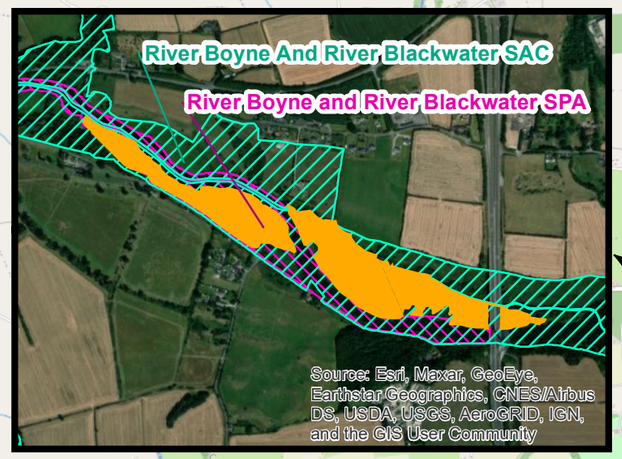
[25] Ability to utilise alternative habitats refers to the species ability to utilise other habitats adjacent to the site. 1 = wide-ranging species with requirement to utilise the site as and when required; 2 = reliant on site but highly likely to utilise alternative habitats at certain times (e.g. high tide); 3 = considered totally reliant on wetland habitats due to unsuitable surrounding habitats and/or species limited habitat requirements.

Species Name	Habitat Preference	Status (Breeding and/or Wintering) / Foraging Details	Likely Occurrence within the ZoI of the Proposed Scheme?	Likely Occurrence Downstream of the Proposed Scheme?	Ability to Utilise Other/Alternative habitats[25] (NPWS, 2012b)	Noted During Field Surveys?
	restricted to uplands in NW Ireland with heather moors, blanket bogs, and acidic grasslands.	as a roosting/resting habitat and the birds tend to favour large, open tidal flats.	desk study results from the NBDC have also noted this species throughout the wider area of Slane.	open areas about the foreshore.		
Grey Plover *Pluvialis squatarola* [A141]	Distribution in Ireland is widespread, but exclusively coastal. They occur mostly along eastern and southern coasts, most often on large muddy estuaries. They regularly roost among dense flocks during high tide, while their distribution is more scattered while feeding.	**Status**: Wintering (non-breeding). Forage on a wide variety of burrowing intertidal invertebrates such as polychaete worms and molluscs, in coastal areas.	No. The Proposed Scheme does not support habitat for this species to occur. Occurring mostly along the eastern and southern coast, grey plover are considered exclusively coastal, most often found on large muddy estuaries.	**Yes.** Supporting intertidal/estuarine habitat for roosting and foraging available downstream of the Proposed Scheme.	3	✗
Northern Lapwing *Vanellus vanellus* [A142]	Irish resident and summer visitor across wetlands, pasture and rough land adjacent to bogs. Breed on open farmland, and bare fields.	**Status**: Wintering (non-breeding). Forage on a variety of soil and surface-living invertebrates. Will readily exploit temporary food sources, such as ploughed fields and on the edge of floodwaters. Considered to be a 'terrestrial wader', typically foraging across grassland and using tidal flats mainly for roosting (NPWS, 2012a).	**Yes.** The immediate surrounding area of the Proposed Scheme supports preferred habitat types for this species such as agricultural land and meadows where they can be found nesting in short grass or on bare ground. Furthermore, desk study results from the NBDC have also noted this species throughout the wider area of Slane.	**Yes.** Supporting intertidal/estuarine habitat (i.e. mudflats) for roosting available downstream of the Proposed Scheme such as coastal grasses and marsh.	2	✓
Red Knot *Calidris canutus* [A143]	Winter visitor to Irish coasts between October & February. The preferred habitat mostly includes estuarine sites with extensive areas of muddy sand. They occur mostly in large flocks and on fewer	**Status**: Wintering (non-breeding). This wading species forages predominately on bivalve mussels and crustaceans on estuaries and sandy coasts.	No. The Proposed Scheme does not support habitat or a food source for this species to occur.	**Yes.** Supporting intertidal/estuarine habitat for roosting and foraging available downstream of the Proposed Scheme.	3	✗

Species Name	Habitat Preference	Status (Breeding and/or Wintering) / Foraging Details	Likely Occurrence within the Zol of the Proposed Scheme?	Likely Occurrence Downstream of the Proposed Scheme?	Ability to Utilise Other/Alternative habitats[25] (NPWS, 2012b)	Noted During Field Surveys?
	estuaries than other wader species.					
Sanderling *Calidris alba* [A144]	First seen along the Irish coastline in July or August, though most arrive in Ireland between September & April. Found along sandy coastlines, especially non-estuarine.	**Status**: Wintering (non-breeding). Forage predominantly on small invertebrates. Most important prey in estuarine sites include siphons of the bivalve *Scrobicularia plana*, polychaetes and the gastropod *Hydrobia ulvae* (Lourenço et al., 2015).	No. The Proposed Scheme does not support habitat or a food source for this species to occur.	**Yes.** Supporting intertidal/estuarine habitat for roosting and foraging available downstream of the Proposed Scheme.	3	✕
Black-tailed Godwit *Limosa limosa* [A156]	Winter visitor to both inland and coastal estuarine habitats. Rare Irish breeding sites in lowland wet grassland and marshes.	**Status**: Wintering (non-breeding). Forage on a range of invertebrates, including bivalves, polychaete worms and shore crabs. Prefer to feed on muddier estuaries, but also in brackish pools and on nearby rough pasture, where they feed on crane fly larvae and the amphipod *Corophium volutator* (BirdWatch Ireland, 2021).	No. Although there is potential for this bird to occur within pastures, occasional feeding would be close to coastal habitat. The Proposed Scheme does not support habitat or a food source for this species. In terms of its ability to use other habitats, this species would likely use those in proximity to the coastline.	**Yes.** Supporting intertidal/estuarine/coastal habitat for roosting and foraging available downstream of the Proposed Scheme.	2	✕
Redshank *Tringa tetanus* [A162]	Resident and visitor populations. A common wader of wetlands throughout the country, though mainly coastal estuaries in winter. Nests in grassy tussock, in wet, marshy areas and occasionally heather. Breeds mainly in midlands.	**Status**: Wintering (non-breeding). Forage singly or in small groups along the upper shore of estuaries and along muddy river channels. Prey consists mostly of *Hydrobia* sp., *Corophium* sp. and nereid worms. A study found that in up to 20% of tagged redshank, the maximum foraging range was 4 km (Burton, 2000).	No. Although the River Boyne is classified as a river channel it does not support muddy habitat within the immediate environs of the Proposed Scheme. In terms of its ability to use other habitats, this species would likely use those in proximity to the coastline, where the fast flowing (high velocity) water from the Boyne deposit sediment as they meet the sea (low velocity).	**Yes.** Supporting intertidal/estuarine/muddy for roosting and foraging river channel habitat available downstream of the Proposed Scheme.	2	✕

Species Name	Habitat Preference	Status (Breeding and/or Wintering) / Foraging Details	Likely Occurrence within the Zol of the Proposed Scheme?	Likely Occurrence Downstream of the Proposed Scheme?	Ability to Utilise Other/Alternative habitats[25] (NPWS, 2012b)	Noted During Field Surveys?
Ruddy Turnstone *Arenaria interpres* [A169]	Winter visitor, occurs late July to late April. Winters all around the Irish coast, particularly on rocky shores, headlands, islands and piers. Does not breed in Ireland.	**Status**: Wintering (non-breeding). Forages on sandhoppers and other marine invertebrates, as well as fish carrion washed up on shore. Preferred habitat is sandy coastlines and mudflats.	No. The Proposed Scheme does not support habitat or a food source for this species to occur. In terms of its ability to use other habitats, this species would likely use those in proximity to the coastline.	**Yes.** Supporting intertidal/estuarine/coastal habitat for roosting and foraging available downstream of the Proposed Scheme.	2	✕
Little Tern *Sterna albifrons* [A195]	Rare summer visitor from April to late August to shingle or sandy beaches, mainly on the east and west coasts. Nest colonially on the ground on shingle beaches. Only a few colonies are found in Ireland, with the majority breeding in Counties Louth, Wicklow and Wexford.	**Status**: Breeding. Forages on fish, crustaceans and invertebrates in shallow waters along sheltered coasts. The maximum foraging range for this designated species as described by Woodward et al., (2019) is 5 km (mean max is 3.5 km).	No. The Proposed Scheme does not support habitat or a food source for this species to occur. Furthermore, the Proposed Scheme is also much beyond the known foraging distances for the species.	**Yes.** Supporting intertidal/estuarine/coastal habitat for foraging and nesting available downstream of the Proposed Scheme.	n/a	✕

Note: Those shaded with colour are discussed in further detail in **Section 6.**



River Boyne and River Blackwater SPA
River Boyne And River Blackwater SAC

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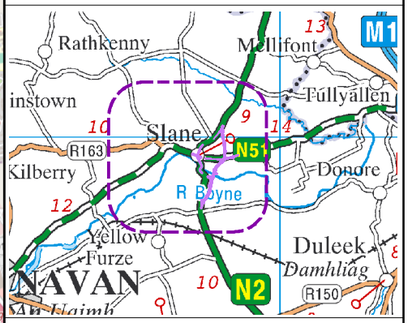
Legend

- Proposed Scheme
- Proposed Scheme Boundary
- Alluvial forest [91E0]
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

Data Source: NPWS Special Areas of Conservation (2023), Special Protection Areas (2023), and Alluvial Forest Habitat [91E0] (2019)

0 0.5 1 2
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 4.3:

Annex I Habitat in proximity to the Proposed Scheme

West Pier Business Campus, Dun Laoghaire, Co Dublin, Ireland.
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Issue Details

File Identifier: MDT0806-RPS-00-N2-DR-Z-AG-3042		
Status: A1	**Rev:** C01	**Model File Identifier:** MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000
Drawn: NR		**Date:** 25/05/2023
Checked: HF		**Scale:** 1:35,000 (A3)
Approved: RR		**Projection:** ITM

NOTE:

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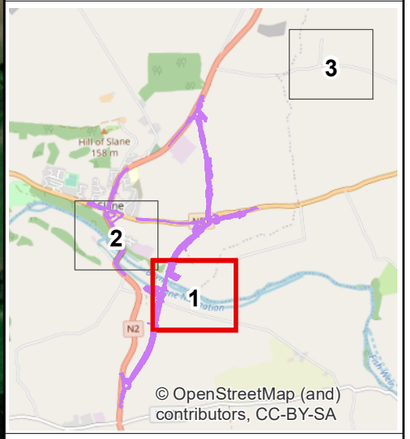
Legend

- Proposed Scheme
- Proposed Scheme Boundary

Invasive Alien Plant Species

- Himalayan Balsam
- Japanese Knotweed

0 0.0375 0.075 0.15
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 4.4:

Invasive Alien Plant Species within the ZoI of the Proposed Scheme Map 1 of 3

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Issue Details

File Identifier:
MDT0806-RPS-00-N2-DR-Z-AG-3083

Status:	Rev:	Model File Identifier:
A1	C01	MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000

Drawn: NR	**Date:** 25/05/2023
Checked: HF	**Scale:** 1:3,000 (A3)
Approved: RR	**Projection:** ITM

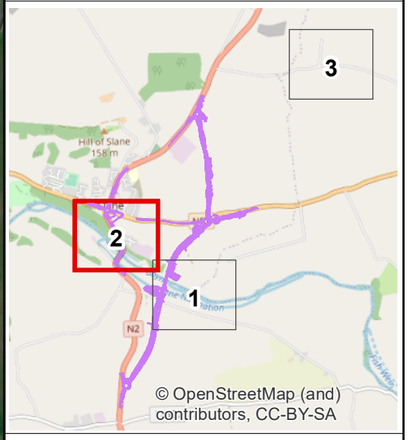
Legend

- Proposed Scheme
- Proposed Scheme Boundary

Invasive Alien Plant Species

- Himalayan Balsam
- Japanese Knotweed

0 0.0375 0.075 0.15
Kilometres



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 4.4:

Invasive Alien Plant Species within the ZoI of the Proposed Scheme Map 2 of 3

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Issue Details

File Identifier:
MDT0806-RPS-00-N2-DR-Z-AG-3083

Status:	Rev:	Model File Identifier:
A1	C01	MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000

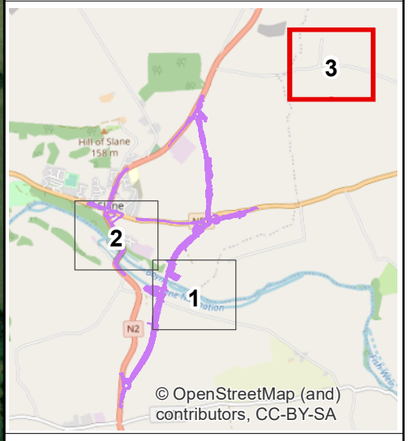
Drawn: NR	**Date:** 25/05/2023
Checked: HF	**Scale:** 1:3,000 (A3)
Approved: RR	**Projection:** ITM

Legend

Invasive Alien Plant Species

- Japanese Knotweed

0 0.0375 0.075 0.15
Kilometres



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N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 4.4:

Invasive Alien Plant Species within the ZoI of the Proposed Scheme Map 3 of 3

West Pier
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Issue Details

File Identifier:
MDT0806-RPS-00-N2-DR-Z-AG-3083

Status:	Rev:	Model File Identifier:
A1	C01	MDT0806-RPS-01-N2-M2-C-XM1001 MDT0806-RPS-01-PR-M2-C-XR9000

Drawn: NR	**Date:** 25/05/2023
Checked: HF	**Scale:** 1:3,000 (A3)
Approved: RR	**Projection:** ITM

NOTE:

4.7 North-west Irish Sea SPA

4.7.1 Overview

According to the NPWS, the North-west Irish Sea SPA extends offshore along the coasts of counties Louth, Meath and Dublin, and is approximately 2,3k m^2 in area. This SPA is ecologically connected to several existing SPAs in this area. The estuaries and bays that open into it along with connecting coastal stretches of intertidal and shallow subtidal habitats, provide safe feeding and roosting habitats for waterbirds throughout the winter and migration periods. These areas, along with more pelagic marine waters further offshore, provide additional supporting habitats (for foraging and other maintenance behaviours) for those seabirds that breed at colonies on the north-west Irish Sea's islands and coastal headlands. These marine areas are also important for seabirds outside the breeding period (NPWS, 2023b).

4.7.2 SCI birds

The North-West Irish Sea SPA is designated for 21 bird species. Of these, eight species are considered exclusively marine using offshore marine waters and/or sea cliffs and for which an impact pathway with the Proposed Scheme has not been identified. On this basis, Great Northern Diver, Fulmar, Manx Shearwater, Kittiwake, Roseate Tern, Guillemot, Razorbill and Puffin have not been considered further in this assessment. Of the remaining SCI species, thirteen could potentially occur downstream of the Proposed Scheme within coastal, marsh and wetland habitat, and six could potentially use the site of the Proposed Scheme for commuting and foraging purposes and of which were recorded during field surveys within the Proposed Scheme (see **Table 4-9)**.

While site specific Conservation Objective are available for the site, the Conservation Objective Supporting document (i.e. conservation condition and population trends) and the Natura 2000 form are not currently available for the North-west Irish Sea SPA. However, **Sections 4.7.3** and **Section 4.7.4** provides the relevant field survey data available for the relevant SCI species of the North-west Irish Sea SPA associated with the Proposed Scheme. **Table 4-9** provides more recent information regarding the BOCCI status as per Gilbert *et al.* (2021) of relevant SCI species.

4.7.3 Breeding bird surveys

For information related to methodology and timing of breeding bird surveys, see **Section 4.6.3**.

Species recorded during breeding bird surveys of relevance to the North-West Irish Sea SPA include Black-headed gull, Cormorant, Herring gull, Great black-backed gull and Lesser black-backed gull, all of which were recorded flying over the Proposed Scheme. During the surveys completed over three consecutive years, no SCI species (other than kingfisher) were confirmed breeding within or immediately adjacent to the footprint of the Proposed Scheme. This includes all of the SCI species of the North-West Irish Sea SPA.

4.7.4 Wintering bird surveys

For information related to methodology and timing of wintering bird surveys, see **Section 4.6.4**.

The results of the wintering bird surveys, as relevant to the SCIs of this SPA, are summarised in **Table 4-8** below. Species recorded of relevance to the North-West Irish Sea SPA are Cormorant, Common gull, Black-head gull and Herring gull for the reasons detailed in Table 4-9.

Table 4-8: Relevant Wintering Bird Survey Results – North-West Irish Sea SPA.

SCI Species Name	No. of flights recorded	Date of Survey	Flock size	Location
Vantage Point Survey				
2019/2020 (Secondary species)				
Cormorant	20	-	30	VP1/2
2020/2021 (Secondary species)				
Cormorant	33	-	35	VP1/2
2021/2022 (Secondary species)				
Cormorant	16	-	25	VP1/2

SCI Species Name	No. of flights recorded	Date of Survey	Flock size	Location
Wintering Farmland Bird Survey				
2019/2020				
Common gull	-	18.12.2019	2	Site of the Proposed Scheme
	-	18.02.2020	5	Site of the Proposed Scheme
Black-headed gull	-	18.12.2019	15	Site of the Proposed Scheme
	-	07.12.2020	5	Site of the Proposed Scheme
	-	18.02.2020	14	Site of the Proposed Scheme
	-	17.03.2020	2	Site of the Proposed Scheme
Cormorant	-	05.12.2019	1	Site of the Proposed Scheme
	-	18.12.2019	2	Site of the Proposed Scheme
	-	18.02.2020	2	Site of the Proposed Scheme
	-	17.03.2020	1	Site of the Proposed Scheme
Herring gull	-	05.12.2019	3	Site of the Proposed Scheme
	-	07.12.2020	4	Site of the Proposed Scheme
	-	18.02.2020	3	Site of the Proposed Scheme
2020/2021				
Common gull	-	28.01.2021	4	Site of the Proposed Scheme
	-	18.02.2021	6	Site of the Proposed Scheme
Black-headed gull	-	22.12.2020	10	Site of the Proposed Scheme
Cormorant	-	10.11.2020	1	Site of the Proposed Scheme
	-	22.12.2020	1	Site of the Proposed Scheme
	-	28.01.2021	1	Site of the Proposed Scheme
	-	18.02.2021	1	Site of the Proposed Scheme
Herring gull	-	28.01.2021	3	Site of the Proposed Scheme
2021/2022				
Black-headed gull		31.01.2022	26	Site of the Proposed Scheme
Overwintering Wildfowl Survey				
2019/2020				
n/a	-	n/a	n/a	n/a
2020/2021				
Cormorant	-	09.11.2020	1	Boyne
	-	03.12.2020	2	Boyne
	-	04.01.2021	2	Boyne
	-	11.01.2021	2	Boyne
	-	04.02.2021	3	Boyne
	-	19.02.2021	1	Boyne
	-	18.03.2021	1	Boyne
2021/2022				
n/a	n/a		n/a	n/a

Table 4-9: Habitat Preferences, Foraging Range and likely occurrence of SCI Birds of the North-west Irish Sea SPA in relation to the Proposed Scheme

Species Name	BoCCI Category[26]	Habitat Preference	Status (Breeding and/or Wintering) / Foraging Details[27]	Likely Occurrence within the ZoI of the Proposed Scheme?	Likely Occurrence Downstream of the Proposed Scheme?	Noted During Field Surveys?
Red-throated Diver *Gavia stellata* [A001]	Amber	Winter visitor to all Irish coasts from September to April. Breed on small fresh water loughs. Favour coastlines where they abundant within shallow sandy bays.	**Status:** Wintering (non-breeding). Forages within freshwater and marine environments diving underwater for small fish such as sprats, sand eels, codling and flatfish. Other food items include fish spawn, frogs, shrimps, molluscs, water insects and annelids.	No. Based on its habitat preference this species would occur inland only when breeding on freshwater lough. The Proposed Scheme does not support such habitat or intertidal/sandy bays.	**Yes.** Supporting sandy shallow bay habitat for foraging and roosting available downstream of the Proposed Scheme.	✗
Cormorant *Phalacrocorax carbo* [A017]	Amber	Resident with some immigration during the winter. Often seen inland where it breeds in trees, and along the coast on cliffs. Can be found near the entrance of estuaries.	**Status:** Breeding. Forages on fish at lakes and along rivers whilst inland, and in marine and estuarine waters along the coastline.	Yes. The River Boyne supports preferred habitat types for this species (i.e. rivers), and was recorded during field surveys along the Boyne in low numbers.	**Yes.** Supporting intertidal/estuarine habitat for foraging and roosting available downstream of the Proposed Scheme.	✓
Shag *Phalacrocorax aristotelis* [A018]	Amber	Resident along all Irish coasts. Breeding occurs on cliff edges, ledges and in caves and crevices. Rarely seen inland and can generally be found on rocky coasts and marine coastlines.	**Status:** Breeding. Forages in the shallow and open ocean selecting a wide range of fish from just below the water surface.	No. Based on its habitat preference this species would occur within coastal cliff, marine and rocky habitat from which it does not stray far from.	**Yes.** Supporting marine waters for foraging and roosting available downstream of the Proposed Scheme.	✗
Common Scoter *Melanitta nigra* [A065]	Red	Resident and winter visitor. During the bereding season, can be found close to lakes and river son islands. During winter, this bird almost entirely marine and tend to congregate in large flocks on shallow seas with sandy bottoms.	**Status:** Wintering (non-breeding). Forages mostly in waters less than 20 m deep and with coarse sandy substrates predominantly on benthic bivalve molluscs.	No. Based on its habitat preference this species would occur inland near rivers, only when breeding. As this bird is designated for its wintering population, it is not likely to occur with the Proposed Scheme.	**Yes.** Supporting shallow sea and sandy bay habitat for foraging and roosting available downstream of the Proposed Scheme.	✗

[26] Status as per Gilbert *et al.* (2021).

[27] In the absence of the Natura 2000 Standard Data Form, the population type (i.e. wintering, breeding, residential, or concentration) of SCI birds of the North-west Irish Sea SPA as described in Table 4-9 is based on the attributes given within the Conservation Objectives document (NPWS, 2023a).

Species Name	BoCCI Category[26]	Habitat Preference	Status (Breeding and/or Wintering) / Foraging Details[27]	Likely Occurrence within the ZoI of the Proposed Scheme?	Likely Occurrence Downstream of the Proposed Scheme?	Noted During Field Surveys?
Little Gull *Larus minutus* [A177]	Amber	Winter visitor. Can be found along coasts and the open ocean.	**Status:** Wintering (non-breeding). Forage in coastal waters by picking small fish, crabs and other invertebrates off the surface of the sea.	No. Based on its habitat preference this species would occur within coastal shallow marine waters and estuarine habitat, of which it is dependant for its food source.	**Yes.** Supporting coastal and shallow sea waters for foraging and roosting available downstream of the Proposed Scheme.	✗
Black-headed Gull *Chroicocephalus ridibundus* [A179]	Amber	Resident along Irish coasts, augmented by numbers from the Continent in winter. Breeds both on the coast and inland in wetland areas, such as bogs and marshes.	**Status:** Wintering (non-breeding). Feeds on insects especially in arable fields. Will also exploit domestic and fisheries waste.	**Yes.** The immediate surrounding area of the Proposed Scheme supports preferred foraging habitat types for this species (i.e. arable land). This bird was recorded flying over the site of the Proposed Scheme during field surveys.	**Yes.** Supporting coastal and wetland and marsh habitat for foraging and roosting available downstream of the Proposed Scheme.	✓
Common Gull *Larus canus* [A182]	Amber	Local breeding species on islands in larger lakes in western Ireland. Winter visitor to all Irish coasts including islands, cliffs and shingle banks.	**Status:** Wintering (non-breeding). Scavenger that forages on terrestrial and aquatic insects, invertebrates, fish and fisheries waste.	No. The Proposed Scheme does not support coastal, cliff or shingle bank habitat for this species to occur.	**Yes.** Supporting coastal habitat for foraging and roosting available downstream of the Proposed Scheme.	✗
Lesser Black-backed Gull *Larus fuscus* [A183]	Amber	Summer visitor to lakes and coasts. During migration and in winter this species can be found on off shore islands, islands in inland lakes, near river and estuaries, beaches and coastal cliffs.	**Status:** Breeding. Forages on a wide variety of prey including fish from the sea, waste from fisheries, rubbish from landfill sites, insects in flight, young birds and food from other birds.	Yes. The Proposed Scheme supports preferred habitat types for this species (i.e. River Boyne). This bird was recorded flying over the site of the Proposed Scheme during field surveys.	**Yes.** Supporting estuarine and coastal habitat for foraging and roosting available downstream of the Proposed Scheme.	✓
Herring Gull *Larus argentatus* [A184]	Amber	Resident along all Irish coasts such as cliffs, beaches and riverine systems, where it breeds. During winter, herring gull widespread on the coast and inland.	**Status:** Resident throughout the year within the North-west Irish Sea SPA. Predator and scavenger feeding on fish, crustaceans, insects and follows fishing boats and uses landfill sites.	Yes. The Proposed Scheme supports preferred habitat types for this species (i.e. riverine habitat). This bird was recorded flying over the site of the Proposed Scheme during field surveys.	**Yes.** Supporting estuarine and coastal habitat for foraging and roosting available downstream of the Proposed Scheme.	✓
Great Black-backed Gull *Larus marinus* [A187]	Green	Resident along all Irish coasts such as on well-vegetated off-shore islands, or in other areas difficult of access, sandy coasts and estuaries.	**Status**: Wintering (non-breeding). Forages on fish waste from commercial fishing, offal, and other birds.	No. Based on its habitat preference this species would occur within coastal shallow marine waters and estuarine habitat, of which it is dependant for its food source. It is noted that this bird was recorded flying over the site of the Proposed Scheme during field surveys, and is	**Yes.** Supporting estuarine and coastal habitat for foraging and roosting available downstream of the Proposed Scheme.	✓

Species Name	BoCCI Category[26]	Habitat Preference	Status (Breeding and/or Wintering) / Foraging Details[27]	Likely Occurrence within the ZoI of the Proposed Scheme?	Likely Occurrence Downstream of the Proposed Scheme?	Noted During Field Surveys?
				likely using the area for commuting purposes.		
Common Tern *Sterna hirundo* [A193]	Amber	Summer visitor. Usually seen over the sea or over large inland lakes. Breeds on the coast and on islets in freshwater lakes.	**Status:** Breeding. Forage over open waters. Chiefly feeds on fish but also feed on crustaceans or insects.	No. The Proposed Scheme does not support open-water habitat in the form of coastal or freshwater lakes.	**Yes.** Supporting coastal habitat for foraging and roosting available downstream of the Proposed Scheme.	✕
Arctic Tern *Sterna paradisaea* [A194]	Amber	Summer visitor along all Irish coasts including estuaries, rocky habitat, islands and the open ocean. During the breeding season, this species can be found inland on fresh water lakes of Lough Corrib (Co. Galway) and Lough Conn (Co. Mayo).	**Status:** Breeding. Forage over open waters on marine fish, crustaceans and insects.	No. The Proposed Scheme does not support open-water habitat for foraging in the form of coastal habitat or breeding habitat in the form of freshwater lakes.	**Yes.** Supporting coastal habitat for foraging and roosting available downstream of the Proposed Scheme.	✕
Little Tern *Sterna albifrons* [A195]	Amber	Rare summer visitor to shingle or sandy beaches, mainly on the east and west coasts. Breeds on the ground on shingle beaches.	**Status:** Breeding. Forages in coastal areas above open waters chiefly on fish but also feed on crustaceans or insects.	No. The Proposed Scheme does not support shingle beach habitat to support breeding. This bird was recorded flying over the site of the Proposed Scheme during field surveys.	**Yes.** Supporting coastal habitat (e.g. beaches) for foraging, breeding and roosting available downstream of the Proposed Scheme.	✕

5 EUROPEAN SITES LIKELY TO BE IMPACTED BY THE PROPOSED SCHEME

5.1 Linkages to European Sites

The Proposed Scheme has connectivity to the River Boyne and River Blackwater SAC (Site code: 002299) and the SPA (Site code: 004232) of the same name due to the Proposed Scheme straddling (in the case of the SPA) or traversing (in the case of the SAC) part of these European Sites. The Proposed Scheme has direct connectivity to these designations as well as downstream connectivity via the River Boyne. The Boyne Coast and Estuary SAC (Site code: 001957) and the Boyne Estuary SPA (Site code: 004080) have potential downstream hydrological connectivity. Consequently, these European sites are assessed further in this report. The predicted impacts that may cause an adverse effect l to these European sites are summarised in **Table 5-1**. Reference should also be made to **Figure 4.1** for the relevant European sites within the ZoI of the Proposed Scheme.

Table 5-1: Connectivity of European Sites within ZoI of the Proposed Scheme and potential for Adverse Effects

Site (Code)	Relevant Qualifying Interest (QI) Habitats and Species (*=Priority Habitat)[28] of Relevance	Distance From the Project[29]	Potential Connectivity	Potential Adverse Effect
Special Area of Conservation				
River Boyne and River Blackwater SAC (002299)	• *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0] • River Lamprey *Lampetra fluviatilis* [1099] • Salmon *Salmo salar* [1106] • Otter *Lutra lutra* [1355]	Intersects the Proposed Scheme	• Activities could lead to the dispersal of scheduled invasive species either via personnel, machinery, materials or clothing; • Hydrological/ hydrogeological connectivity to QI habitats and/or species via surface water run-off from working platforms, working areas, proposed outfalls and connectivity via drainage ditches across the whole scheme; • Noise and vibrations above background levels due to construction methodologies and the presence of machinery and personnel; • The presence of the bridge itself causing a physical obstruction; • The presence of the bridge itself causing changes in flow regimes; • Movement of materials, extraction of materials and their storage; • Construction activities associated with attenuation and retention ponds.; and • The movement of traffic associated with the bridge during the operational phase.	There is potential for direct and indirect effects on the River Boyne and River Blackwater SAC as a result of the Proposed Scheme. **Annex I Habitat:** • Habitat disturbance and/or deterioration (i.e. alteration in species composition) arising from water pollution (i.e. sedimentation) or spread of IAPS from works at the Boyne crossing and the wider scheme; • Habitat fragmentation (i.e. community composition and diversity) arising from water pollution (i.e. sedimentation) or spread of IAPS from works within SAC and within the wider area of the scheme; • Siltation or pollution (hydrocarbons, cement or other construction chemicals) of surface and/or groundwater bodies arising from excavations for establishment of the bridge working platform, bridge placement (i.e. pile foundations) and general sediment run-off from within the area of the wider Proposed Scheme with the potential to effect sediment cycles; • Physical obstruction arising from the presence of the bridge causing changes in hydrological flow regimes/flooding/drainage thus altering erosion and sediment cycles. **Annex II Species:** • Habitat disturbance and/or deterioration arising from water pollution (i.e. sedimentation, oils/chemicals/fuels, accidental pollution events) and spread of IAPS from

[28] Sourced from Conservation Objectives Form for each European Sites NPWS website, accessed November 2021.

[29] Distances measured 'as the crow flies'.

Site (Code)	Relevant Qualifying Interest (QI) Habitats and Species (*=Priority Habitat)[28] of Relevance	Distance From the Project[29]	Potential Connectivity	Potential Adverse Effect
				works within SAC and within the wider area of the scheme; • Habitat loss (primarily for otters) arising from the establishment of the working platform within the SAC floodplain; • Pollution of watercourses arising from suspended sediment accidental spillage and oils and fuels with potential to cause mortalities of species due to effects on water quality within the River Boyne at or above EPA Q4 (i.e. Good or High quality water status) and indirect effects on the availability of resources due to the potential for water pollution and groundwater discharge that meets surface water; • Physical obstruction arising from the presence of the bridge causing a physical barrier to the movement of otter; • Disturbance arising from construction activities and methodologies (i.e. noise, vibration, lighting and human presence) causing displacement or avoidance behaviours; and • The movement of vehicles arising from the operational phase of the proposed Scheme causing direct mortality of otter.
Boyne Coast and Estuary SAC (001957)	• Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • Salicornia and other annuals colonizing mud and sand [1310] • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	13.6 km east	• Activities could lead to the dispersal of scheduled invasive species either via machinery, materials or clothing; and • Hydrological/ hydrogeological connectivity to QI habitats via surface water run-off from working platforms, working areas and connectivity via drainage ditches across the whole scheme.	Although there is theoretical connectivity, via the hydrological pathway of the River Boyne, between the Proposed Scheme and the SAC, it is considered that the risk of the Proposed Scheme resulting in an adverse effect on the designated interests of the SAC is, at most, low. This is due to the distance between the Proposed Scheme and the SAC, the dilution effect on any pollutants over such a distance and, particularly with respect to silts, the natural dynamics of an estuary with respect to the input, mobilisation and deposition of silts as part of its natural function and dynamism. In order for an adverse effect to occur, it is considered that a significant and persistent

Site (Code)	Relevant Qualifying Interest (QI) Habitats and Species (*=Priority Habitat)[28] of Relevance	Distance From the Project[29]	Potential Connectivity	Potential Adverse Effect
	• Mediterranean salt meadows (*Juncetalia maritimi*) [1410]			pollution event/events would have to occur as a result of the construction and/or operation of the proposed scheme to have any detectable adverse effect on the SAC. However, there is greater opportunity for a contribution to any negative environmental pressures which the SAC is already experiencing. Therefore, a highly precautionary approach has been adopted in considering potential adverse effects on this downstream SAC. **Annex I Habitat:** • Habitat deterioration (i.e. alteration in species composition) arising from water pollution (i.e. sedimentation and other pollutants) or spread of IAPS from works within the Proposed Scheme; and • Habitat fragmentation due to habitat deterioration (i.e. community composition and diversity) arising from water pollution (i.e. sedimentation) or spread of IAPS from works within the whole scheme.
Special Protection Area				
River Boyne and River Blackwater SPA (004232)	• Kingfisher *Alcedo atthis* [A229]	Intersects the Proposed Scheme	• Activities could lead to the dispersal of scheduled invasive species either via machinery, materials or clothing; • Hydrological/ hydrogeological connectivity to QI species via surface water run-off from working platforms, proposed outfalls and working areas and connectivity via drainage ditches across the whole scheme; • Noise and vibrations above background levels due to construction methodologies and the presence of machinery and personnel; • The presence of the bridge itself causing physical obstructions; • Movement of materials, extraction of materials and their storage;	There is potential for direct and indirect effects on the River Boyne and River Blackwater SPA as a result of the Proposed Scheme. **Annex II Species:** • Habitat loss (e.g. perch availability) or deliberate destruction of habitat (or breeding sites in the event of any being identified as present during pre-construction surveys); • Habitat deterioration arising from water pollution (i.e. sedimentation, oils/chemicals/fuels, accidental pollution events) and spread of IAPS from works within SAC and within the wider area of the scheme; • Pollution of watercourses arising from suspended sediment accidental spillage and oils and fuels with potential effects on water quality within the River Boyne at or above EPA Q4 (i.e. Good or High quality water

Site (Code)	Relevant Qualifying Interest (QI) Habitats and Species (*=Priority Habitat)[28] of Relevance	Distance From the Project[29]	Potential Connectivity	Potential Adverse Effect
			• Construction activities associated with attenuation and retention ponds	status) and indirect effects on the availability of resources due to the potential for water pollution and groundwater discharge that meets surface water; • Physical obstruction arising from the presence of the bridge causing a physical barrier to the movement of salmon, lamprey or other suitable fish species causing an indirect effect on resource availability; • Disturbance arising from construction activities and methodologies (i.e. noise, vibration, lighting and human presence) causing displacement or avoidance behaviours.
Boyne Estuary SPA (004080)	• Shelduck *Tadorna tadorna* [A048] • Oystercatcher *Haematopus ostralegus* [A130] • Golden Plover *Pluvialis apricaria* [A140] • Grey Plover *Pluvialis squatarola* [A141] • Lapwing *Vanellus vanellus* [A142] • Knot *Calidris canutus* [A143] • Sanderling *Calidris alba* [A144] • Black-tailed Godwit *Limosa limosa* [A156] • Redshank *Tringa tetanus* [A162] • Turnstone *Arenaria interpres* [A169] • Little Tern *Sterna albifrons* [A195]	13.7 km east	• Activities could lead to the dispersal of scheduled invasive species either via machinery, materials or clothing; • Hydrological/ hydrogeological connectivity to QI species via surface water run-off from working platforms, working areas and connectivity via drainage ditches across the whole scheme; • Noise and vibrations above background levels due to construction methodologies and the presence of machinery and personnel; • The presence of the bridge itself causing physical obstructions; • Movement of materials, extraction of materials and their storage; • Construction activities associated with attenuation and retention ponds.	There is potential for indirect effects on the Boyne Estuary SPA as a result of the Proposed Scheme. Although there is theoretical connectivity, via the hydrological pathway of the River Boyne, between the Proposed Scheme and the SPA, it is considered that the risk of the Proposed Scheme resulting in an adverse effect on the designated interests of the SPA is, at most, low. This is due to the distance between the Proposed Scheme and the SPA, the dilution effect on any pollutants over such a distance and, particularly with respect to silts, the natural dynamics of an estuary with respect to the input, mobilisation and deposition of silts as part of its natural function and dynamism. In order for an adverse effect to occur, it is considered that a significant and persistent pollution event/events would have to occur as a result of the construction and/or operation of the proposed scheme to have any detectable adverse effect on the SPA. However, there is greater opportunity for a contribution to any negative environmental pressures which the SPA is already experiencing. Therefore, a highly precautionary approach has been adopted in considering potential adverse effects on this downstream SPA. In addition to the hydrological pathway, there is potential for the footprint of the Proposed Scheme and land immediately adjacent to periodically support populations of bird species

Site (Code)	Relevant Qualifying Interest (QI) Habitats and Species (*=Priority Habitat)[28] of Relevance	Distance From the Project[29]	Potential Connectivity	Potential Adverse Effect
	• Wetlands [A999]			which are SCI of the SPA. It is almost impossible to make a direct link between SPA populations and potential ex-situ populations at this level of spatial separation between the Proposed Scheme and SPA; however a precautionary approach has been adopted. **Annex II Species:** • Habitat deterioration arising from water pollution (i.e. sedimentation, oils/chemicals/fuels, accidental pollution events) and spread of IAPS from works within SAC and within the wider area of the scheme; • Pollution of watercourses arising from suspended sediment accidental spillage and oils and fuels with potential effects on water quality within the River Boyne at or above EPA Q4; and • Ex-situ habitat loss and disturbance arising from construction activities and methodologies (i.e. noise, vibration, lighting and human presence) causing displacement or avoidance behaviours.

5.2 Conservation Objectives of European Sites

European and national legislation places a collective obligation on Ireland to maintain at favourable conservation status areas designated as SACs or SPAs (along with any such candidate sites forming part of the Natura 2000 network and European Sites under Irish legislation). The Government and its agencies (namely NPWS) are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

Favourable conservation status of a habitat is achieved when:

- Its natural range, and area it covers within that range, are stable or increasing;
- The specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future; and
- The conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

The integrity of a European site (referred to in Article 6.3 of the EU Habitats Directive) is determined based on the conservation status of the QI of SACs or the SCI of SPAs. The conservation status of the QIs and SCIs for each site have been obtained through a review of the most recently published (web-published or otherwise) QIs, SCIs, and site-specific Conservation Objectives (SSCOs) for these European sites. The data for the sites being considered in this NIS are summarised in **Table 5-2**, which is based on the most up-to-date information available at the time of drafting in the NIS (June 2023).

The conservation objectives of the respective European sites are also detailed in **Table 5-2** below. Details for the European sites, including site-specific conservation objectives, site characteristics and qualifying features are set out in the following sections.

Table 5-2: Qualifying Interests, Special Conservation Interests and Conservation Objectives of the European Sites Assessed

Site Name/ Code	Relevant Qualifying Interest (QI) Habitats and Species (*=Priority Habitat)[30]	Conservation Objectives
River Boyne and River Blackwater SAC (002299), Conservation Objectives Specific Version 1 (03/12/2021), (NPWS, 2021).	**Annex I Habitat** • *Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	To restore the favourable conservation condition.
	Annex II Species • River Lamprey *Lampetra fluviatilis* [1099]	To restore the favourable conservation condition.
	• Salmon *Salmo salar* [1106]	To restore the favourable conservation condition.
	• Otter *Lutra lutra* [1355]	To maintain the favourable conservation condition.
Boyne Coast and Estuary SAC (001957), Conservation Objectives Specific Version	**Annex I Habitat** • Estuaries [1130]	To maintain the favourable conservation condition.

[30] Sourced from Conservation Objectives Form for each European Sites NPWS website, accessed February 2023.

Site Name/ Code	Relevant Qualifying Interest (QI) Habitats and Species (*=Priority Habitat)[30]	Conservation Objectives
1.0 (31/10/2012), (NPWS, 2012a).	• Mudflats and sandflats not covered by seawater at low tide [1140]	To maintain the favourable conservation condition.
	• Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]	To maintain the favourable conservation condition.
	• *Salicornia* and other annuals colonizing mud and sand [1310]	To restore the favourable conservation condition.
	• Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Under review
River Boyne and River Blackwater SPA (004232), First Order Site-specific Conservation Objectives Version 1.0 (12/10/2022), (NPWS, 2022).	**Annex II Species** • Kingfisher *Alcedo atthis* [A229]	To maintain or restore the favourable conservation condition.
Boyne Estuary SPA (004080), Conservation Objectives Specific Version 1.0 (26/02/2013), (NPWS, 2013b).	**Annex II Species** • Shelduck *Tadorna tadorna* [A048] • Oystercatcher *Haematopus ostralegus* [A130] • Golden Plover *Pluvialis apricaria* [A140] • Grey Plover *Pluvialis squatarola* [A141] • Lapwing *Vanellus vanellus* [A142] • Knot *Calidris canutus* [A143] • Sanderling *Calidris alba* [A144] • Black-tailed Godwit *Limosa limosa* [A156] • Redshank *Tringa tetanus* [A162] • Turnstone *Arenaria interpres* [A169] • Little Tern *Sterna albifrons* [A195] **Annex I Habitat** • Wetlands [A999]	To maintain the favourable conservation condition.

5.2.1 Site-specific Conservation Objectives

5.2.1.1 River Boyne and River Blackwater SAC

Site-specific Conservation Objectives are available for the River Boyne and River Blackwater SAC. The detailed conservation objectives for the maintenance of habitats and species for each of the qualifying interests are provided in the Conservation Objectives document available on the NPWS website (NPWS, 2021). As detailed in **Table 5-2**, the overarching conservation objective for the River Boyne and River Blackwater SAC is as follows: *To maintain or restore the favourable conservation condition* of the Annex I habitats and Annex II species (QIs) for which the SAC has been selected.

Table 5-3 provides detail on the conservation condition of the QIs/SCIs of the site as per the Natura 2000 Data Form for the site (NPWS, 2019d) and details on the site-specific attributes and targets of the QIs/SCIs (NPWS, 2021) likely to be impacted by the Proposed Scheme, in the absence of mitigation measures. For further detail on the targets associated with site-specific attributes see **Section 6**.

Table 5-3: River Boyne and River Blackwater SAC Conservation Condition and Site-specific Conservation Objectives

Annex I Qualifying Habitat/ Annex II Qualifying Species	Representativity	Population Significance	Objective	Site-specific Attributes
*Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	B	-	Restore	Habitat area Habitat distribution Woodland size Woodland structure: cover and height Woodland structure: community diversity and extent Woodland structure: natural regeneration Hydrological regime: flooding depth/height of water table Woodland structure: dead wood Woodland structure: veteran trees Woodland structure: indicators of local distinctiveness Vegetation composition: native tree cover Vegetation composition: typical species Vegetation composition: negative indicator species Vegetation composition: problematic native species
River Lamprey *Lampetra fluviatilis* [1099]	-	C	Restore	Distribution Distribution of larvae Population structure of larvae Larval lamprey density in fine sediment Extent and distribution of spawning nursery habitat
Salmon *Salmo salar* [1106]	-	C	Restore	Distribution: extent of anadromy Adult spawning fish Salmon fry abundance Out-migrating smolt abundance Number and distribution of redds Water quality
Otter *Lutra lutra* [1355]	-	C	Maintain	Distribution Extent of terrestrial habitat Couching sites and holts Fish biomass available Barriers to connectivity

5.2.1.2 Boyne Coast and Estuary SAC

Site-specific Conservation objectives are available for the Boyne Coast and Estuary SAC. The detailed conservation objectives for the maintenance of habitats and species for each of the qualifying interests are provided in the Conservation Objectives document available on the NPWS website (NPWS, 2012a). As detailed in **Table 5-2**, the overarching conservation objective for the Boyne Coast and Estuary SAC is as follows: *To maintain or restore the favourable conservation condition* of the Annex I habitats (QIs) for which the SAC has been selected.

Site-specific Conservation objectives are not available for the QI habitat, Mediterranean salt meadows (*Juncetalia maritimi*). In the absence of site-specific attributes, the next closest European site designated for this habitat type and which provides specific attributes has been used. In this case, the closest site is Dundalk Bay SAC (000455). These are detailed in **Table 5-4**.

Table 5-4 provides detail on the conservation condition of the QIs of the site as per the Natura 2000 Data Form for the site (NPWS, 2018) and details only the site-specific attributes and targets of the QIs (NPWS, 2012a) likely to be impacted from the Proposed Scheme, in the absence of mitigation measures. For further detail on the targets associated with site-specific attributes see **Section 6**.

Table 5-4: Boyne Coast and Estuary SAC Conservation Condition and Site-specific Conservation Objectives

Annex I Qualifying Habitat/ Annex II Qualifying Species	Representativity	Population Significance	Objective	Site-specific Attributes
Estuaries [1130]	C	-	Maintain	Habitat area Community distribution
Mudflats and sandflats not covered by seawater at low tide [1140]	C	-	Maintain	
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]	B	-	Maintain	Habitat area Habitat distribution Physical structure: sediment supply Physical structure: creeks and pans Physical structure: flooding regime Vegetation structure: zonation Vegetation structure: vegetation height Vegetation structure: vegetation cover Vegetation composition: typical species and sub-communities Vegetation structure: negative indicator species - *Spartina anglica*
Salicornia and other annuals colonizing mud and sand [1310]	C	-	Restore	
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	D	-	Under Review (site-specific attributes derived from Dundalk Bay SAC)	

5.2.1.3 River Boyne and River Blackwater SPA

The published Conservation Objective states that the favourable conservation status of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

These are detailed in **Table 5-5**.

As detailed in **Table 5-2**, the overarching conservation objective for the River Boyne and River Blackwater SAC is as follows: *To maintain or restore the favourable conservation condition* of the bird species listed as Special Conservation Interests for this SPA.

Table 5-5: River Boyne and River Blackwater SPA Conservation Condition and Favourable Conservation Status

Annex I Qualifying Habitat/ Annex II Qualifying Species	Representativity	Population Significance	Objective	Favourable Conservation Status of a Species
Kingfisher *Alcedo atthis* [A229]	N/A	N/A	Maintain or Restore	Population dynamics Natural range Sufficiently large habitat

5.2.1.4 Boyne Estuary SPA

Site-specific conservation Objectives are available for the Boyne Estuary SPA. The detailed conservation objectives for the maintenance of habitats and species for each of the qualifying interests are provided in the Conservation Objectives document available on the NPWS website (NPWS, 2013b). As detailed in **Table 5-2**, the overarching conservation objective for the Boyne Estuary SPA is as follows: *To maintain the favourable conservation condition* of the Annex I habitats and Annex II species (QIs) for which the SAC has been selected.

Table 5-6 provides detail on the conservation condition of the QIs/SCIs of the site as per the Natura 2000 Data Form for the site (NPWS, 2020a) and details on the site-specific attributes and targets of the QIs/SCIs (NPWS, 2013b) likely to be impacted from the Proposed Scheme, in the absence of mitigation measures. For further detail on the targets associated with site-specific attributes see **Section 6**.

Table 5-6: Boyne Estuary SPA Conservation Condition and Site-specific Conservation Objectives

Annex I Qualifying Habitat/ Annex II Qualifying Species	Representativity	Population Significance	Objective	Site-specific Attributes
Shelduck *Tadorna tadorna* [A048]	-	C	Maintain	Population trend Distribution
Oystercatcher *Haematopus ostralegus* [A130]	-	C	Maintain	
Golden Plover *Pluvialis apricaria* [A140]	-	B	Maintain	
Grey Plover *Pluvialis squatarola* [A141]	-	C	Maintain	
Lapwing *Vanellus vanellus* [A142]	-	B	Maintain	
Knot *Calidris canutus* [A143]	-	B	Maintain	
Sanderling *Calidris alba* [A144]	-	C	Maintain	
Black-tailed Godwit *Limosa limosa* [A156]	-	B	Maintain	
Redshank *Tringa tetanus* [A162]	-	C	Maintain	
Turnstone *Arenaria interpres* [A169]	-	C	Maintain	
Little Tern *Sterna albifrons* [A195]	-	C	Maintain	Breeding population abundance: apparently occupied nests (AONs)

Annex I Qualifying Habitat/ Annex II Qualifying Species	Representativity	Population Significance	Objective	Site-specific Attributes
				Productivity rate: fledged young per breeding pair Distribution: breeding colonies Disturbance at the breeding site Prey biomass available Barriers to connectivity
Wetlands [A999]	-	-	Maintain	Habitat area

5.2.1.5 North-west Irish Sea SPA

Site-specific conservation objectives are available for the North-west Irish Sea SPA available on the NPWS website (NPWS, 2023a). As detailed in **Table 5-7**, the overarching conservation objective for the North-west Irish Sea SPA is as follows:

To maintain or restore the favourable conservation condition of the Annex II species (QIs) for which the SPA has been selected.

The Conservation Objective Supporting document and Natura 2000 Data Form are not currently available for the North-west Irish Sea SPA. However, details on the site-specific attributes and targets for the SCIs are available (NPWS, 2023a) and those likely to be impacted from the Proposed Scheme, in the absence of mitigation measures are provided in **Section 6**.

Table 5-7: North-west Irish Sea SPA Site-specific Conservation Objectives

Annex I Qualifying Habitat/ Annex II Qualifying Species	Objective	Site-specific Attributes
Red-throated Diver *Gavia stellata* [A001]	Maintain	Non-breeding population size Spatial distribution Forage spatial distribution, extent and abundance Disturbance across the site Barriers to connectivity and site use
Cormorant *Phalacrocorax carbo* [A017]	Restore	Non-breeding population size Spatial distribution Forage spatial distribution, extent, abundance and availability Disturbance across the site Barriers to connectivity
Shag *Phalacrocorax aristotelis* [A018]	Restore	Breeding population size Spatial distribution Forage spatial distribution, extent, abundance and availability Disturbance across the site Barriers to connectivity
Common Scoter *Melanitta nigra* [A065]	Maintain	Non-breeding population size Spatial distribution Forage spatial distribution, extent and abundance Disturbance across the site Barriers to connectivity and site use
Little Gull *Larus minutus* [A177]	Maintain	Breeding population size Spatial distribution Forage spatial distribution, extent, abundance and availability Disturbance across the site Barriers to connectivity

Annex I Qualifying Habitat/ Annex II Qualifying Species	Objective	Site-specific Attributes
Black-headed Gull *Chroicocephalus ridibundus* [A179]	Maintain	Non-breeding population size Spatial distribution Forage spatial distribution, extent and abundance Disturbance across the site Barriers to connectivity and site use
Common Gull *Larus canus* [A182]	Maintain	
Lesser Black-backed Gull *Larus fuscus* [A183]	Maintain	Breeding population size Spatial distribution Forage spatial distribution, extent, abundance and availability Disturbance across the site Barriers to connectivity
Herring Gull *Larus argentatus* [A184]	Restore	Population size Spatial distribution Forage spatial distribution, extent, abundance and availability Disturbance across the site Barriers to connectivity
Great Black-backed Gull *Larus marinus* [A187]	Maintain	Non-breeding population size Spatial distribution Forage spatial distribution, extent and abundance Disturbance across the site Barriers to connectivity and site use
Common Tern *Sterna hirundo* [A193]	Maintain	Breeding population size Spatial distribution Forage spatial distribution, extent, abundance and availability Disturbance across the site Barriers to connectivity
Arctic Tern *Sterna paradisaea* [A194]	Maintain	
Little Tern *Sterna albifrons* [A195]	Maintain	

5.2.2 Threats and Pressures to European Sites

Table 5-8 to **Table 5-11** present the current threats, pressures and activities that represent negative impacts to each European Site as quoted on the Natura 2000 Data Forms for the four European sites discussed in **Section 5.2** above. These threats and pressures are existing irrespective of any additional and potential pressures contributed by the Proposed Scheme. A Natura 2000 Data Form is not currently available from NPWS for the North-west Irish Sea SPA.

Table 5-8: Threats, Pressures and Impacts Activities on the River Boyne and River Blackwater SAC

European Site	Threat Code[31]	Threat Type	Rank[32]	i (inside) / o (outside) / b (both)
River Boyne and River Blackwater SAC	G02.10	Other sport/ leisure complexes	M	i
	H01	Pollution to surface waters (limnic, terrestrial, marine & brackish)	H	i
	D01.05	Bridge, viaduct	L	i
	A07	Use of biocides, hormones and chemicals	M	i
	A08	Fertilisation	M	i

[31] Threat codes sourced from Natura 2000 data forms which follow the reference list provided on threats, pressures and activities for European Sites. Available online at: https://ec.europa.eu/environment/nature/natura2000/sites/index_en.htm

[32] H – High, M – Medium, L – Low.

European Site	Threat Code[31]	Threat Type	Rank[32]	i (inside) / o (outside) / b (both)
	A05.02	Stock feeding	M	o
	G01	Outdoor sports and leisure activities, recreational activities	L	i
	J02.15	Other human induced changes in hydraulic conditions	H	i
	A01	Cultivation	M	i
	A10.01	Removal of hedges and copses or scrub	M	i
	C01.01	Sand and gravel extraction	M	i
	G05.06	Tree surgery, felling for public safety, removal of roadside trees	L	i
	G05	Other human intrusions and disturbances	L	i
	A10.01	Removal of hedges and copses or scrub	M	i
	E05	Storage of materials	M	i
	E01.04	Other patterns of habitation	M	i
	J02.11	Siltation rate changes, dumping, depositing of dredged deposits	M	i
	J02.10	Management of aquatic and bank vegetation for drainage purposes	M	i
	D01.02	Roads, motorways	M	i
	E03.02	Disposal of industrial waste	M	i
	E03.04	Other discharges	H	i
	J02	Human induced changes in hydraulic conditions	M	i
	E02	Industrial or commercial areas	H	i
	I01	Invasive non-native species	H	i
	B01.02	Artificial planting on open ground (non-native trees)	M	i

Table 5-9: Threats, Pressures and Impacts Activities on the Boyne Coast and Estuary SAC

European Site	Threat Code	Threat Type	Rank	i (inside) / o (outside) / b (both)
Boyne Coast and Estuary SAC	E03.03	Disposal of inert materials	L	i
	G05.04	Vandalism	L	i
	L07	Storm, cyclone	H	b
	H01	Pollution to surface waters (limnic, terrestrial, marine & brackish)	H	i
	K02	Biocenotic evolution, succession	H	i
	D01.05	Bridge, viaduct	M	i
	J02.12	Dykes, embankments, artificial beaches, general	M	i
	G05	Other human intrusions and disturbances	L	i
	J02.12	Dykes, embankments, artificial beaches, general	M	i
	E01	Urbanised areas, human habitation	M	i
	J02.02	Removal of sediments (mud...)	M	i
	G01.02	Walking, horseriding and non-motorised vehicles	M	o
	G01.03.02	Off-road motorized driving	M	i
	E05	Storage of materials	M	b
	J02.12.01	Sea defence or coast protection works, tidal barrages	L	i

European Site	Threat Code	Threat Type	Rank	i (inside) / o (outside) / b (both)
	E03.01	Disposal of household / recreational facility waste	H	b
	I01	Invasive non-native species	H	i
	J02.01.03	Infilling of ditches, dykes, ponds, pools, marshes or pits	M	i

Table 5-10: Threats, Pressures and Impacts Activities on the River Boyne and River Blackwater SPA

European Site	Threat Code	Threat Type	Rank	i (inside) / o (outside) / b (both)
River Boyne and River Blackwater SPA	J02	Human induced changes in hydraulic conditions	M	i
	E01	Urbanised areas, human habitation	H	o
	D01.02	Roads, motorways	H	i
	D01.02	Roads, motorways	H	o
	E01.03	Dispersed habitation	H	o

Table 5-11: Threats, Pressures and Impacts Activities on the Boyne Estuary SPA

European Site	Threat Code	Threat Type	Rank	i (inside) / o (outside) / b (both)
Boyne Estuary SPA	F02.03	Leisure fishing	L	i
	G02.01	Golf course	M	o
	F01	Marine and Freshwater Aquaculture	M	i
	E01	Urbanised areas, human habitation	M	o
	G01.02	Walking, horseriding and non-motorised vehicles	H	i
	I01	Invasive non-native species	H	i
	J02.01.02	Reclamation of land from sea, estuary or marsh	H	i
	J02.05	Modification of hydrographic functioning, general	H	i
	J02.11	Siltation rate changes, dumping, depositing of dredged deposits	H	i

6 APPROPRIATE ASSESSMENT – STAGE 2: NATURA IMPACT STATEMENT

6.1 Findings of the Stage 1 Screening

From the findings of the screening stage presented under separate cover, the possibility of likely significant effects could not be excluded for the following European sites and relevant QIs at the screening stage, in the absence of further evaluation, analysis and/or without the application of mitigation measures. It is noted that since the AA screening was completed, an additional European site has been notified by NPWS, namely; the North-West Irish Sea SPA (site code: 004236). The new North-West Irish Sea SPA has been considered within this NIS in addition to those already identified through the Stage 1 AA screening.

- **River Boyne and River Blackwater SAC** (Site Code: 002299)
  - *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
  - River Lamprey (*Lampetra fluviatilis)* [1099]
  - Salmon (*Salmo salar)* [1106]
  - Otter (*Lutra lutra*) [1355]
- **Boyne Coast and Estuary SAC** (Site Code: 001957)
  - Estuaries [1130]
  - Mudflats and sandflats not covered by seawater at low tide [1140]
  - Salicornia and other annuals colonizing mud and sand [1310]
  - Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330]
  - Mediterranean salt meadows (*Juncetalia maritimi*) [1410]
- **River Boyne and River Blackwater SPA** (Site Code: 004232)
  - Kingfisher (*Alcedo atthis)* [A229]
- **Boyne Estuary SPA** (Site Code: 004080)
  - Shelduck (*Tadorna tadorna)* [A048]
  - Oystercatcher (*Haematopus ostralegus)* [A130]
  - Golden Plover (*Pluvialis apricaria)* [A140]
  - Grey Plover (*Pluvialis squatarola)* [A141]
  - Lapwing (*Vanellus vanellus)* [A142]
  - Knot (*Calidris canutus)* [A143]
  - Sanderling (*Calidris alba)* [A144]
  - Black-tailed Godwit (*Limosa limosa)* [A156]
  - Redshank (*Tringa tetanus)* [A162]
  - Turnstone (*Arenaria interpres)* [A169]
  - Little Tern (*Sterna albifrons)* [A195]
  - Wetlands [A999]
- **North-West Irish Sea SPA** (Site Code: 004236)
  - Red-throated Diver *Gavia stellata* [A001]
  - Cormorant *Phalacrocorax carbo* [A017]
  - Shag *Phalacrocorax aristotelis* [A018]

- Common Scoter *Melanitta nigra* [A065]
- Little Gull *Larus minutus* [A177]
- Black-headed Gull *Chroicocephalus ridibundus* [A179]
- Common Gull *Larus canus* [A182]
- Lesser Black-backed Gull *Larus fuscus* [A183]
- Herring Gull *Larus argentatus* [A184]
- Great Black-backed Gull *Larus marinus* [A187]
- Common Tern *Sterna hirundo* [A193]
- Arctic Tern *Sterna paradisaea* [A194]
- Little Tern *Sterna albifrons* [A195]

6.2 River Boyne and River Blackwater SAC

6.2.1 Assessment Against Relevant Conservation Objectives

Site-specific Conservation Objectives for the River Boyne and River Blackwater SAC were reviewed (NPWS, 2012a) (see **Section 5.2.1.1**). The prediction of adverse effects on site integrity for 'relevant' site-specific attributes and QIs scoped into the assessment during the construction and operation of the Proposed Scheme are outlined in **Table 6-1**.

Table 6-1: Prediction of Effects on Site Integrity (QIs) of the River Boyne and River Blackwater SAC During all Phases of the Proposed Scheme

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat (NPWS, 2019d)	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2021; Version 1 03/12/2021)	Target
*Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	Water pollution (i.e. sedimentation and contaminants); disturbance (i.e. noise, vibration, human presence and lighting); air pollution; bridge shading.	Pollution to surface waters (limnic, terrestrial, marine & brackish) (H01); Bridge, viaduct (D01.05); Other human intrusions and disturbances (G05); Siltation rate changes, dumping, depositing of dredged deposits (J02.11); Roads, motorways (D01.02); Other discharges (E03.04); Human induced changes in hydraulic conditions (J02); Invasive non-native species (I01).	**Habitat area** Potential identified	Area stable or increasing, subject to natural processes.
			Habitat distribution Potential identified	No decline, subject to natural processes.
			Woodland size Potential identified	Area stable or increasing. Where topographically possible, 'large' woods at least 25 ha in size and 'small' woods at least 3 ha in size.
			Woodland structure: cover and height Potential identified	Total canopy cover at least 30%; median canopy height at least 7m; native shrub layer cover 10-75%; native herb/dwarf shrub layer cover at least 20% and height at least 20 cm; bryophyte cover at least 4%.
			Woodland structure: community diversity and extent Potential identified	Maintain diversity and extent of community types.
			Woodland structure: natural regeneration Potential identified	Seedlings, saplings and pole age-classes of target species for 91E0* woodlands and other native tree species occur in adequate proportions to ensure survival of woodland canopy.
			Woodland structure: dead wood Potential identified	At least 19 stems/ ha of dead wood of at least 20 cm diameter.
			Woodland structure: veteran trees Potential identified	No decline.
			Woodland structure: indicators of local distinctiveness Potential identified	No decline in distribution and, in the case of red listed and other rare or localised species, population size.
			Vegetation composition: native tree cover Potential identified	No decline. Native trees cover at least 90% of canopy; target species cover at least 50% of canopy.
			Vegetation composition: typical species Potential identified	At least 1 target species for 91E0* woodlands present; at least 6 positive indicator species for 91E0* woodlands present.

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat (NPWS, 2019d)	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2021; Version 1 03/12/2021)	Target
			Hydrological regime: flooding depth/height of water table Potential identified	Appropriate hydrological regime necessary for maintenance of alluvial vegetation.
			Vegetation composition: negative indicator species Potential identified	Negative indicator species cover not greater than 10%; regeneration of negative indicator species absent.
			Vegetation composition: problematic native species- Potential identified	Cover of common nettle (*Urtica dioica*) less than 75%.
			Woodland structure: indicators of overgrazing None predicted. The Proposed Scheme will not introduce overgrazing.	All five indicators of overgrazing absent[33].
River Lamprey *Lampetra fluviatilis* [1099]			**Distribution** None predicted. The footprint of the Proposed Scheme is not located within any waterbodies that may interfere with access and will not introduce any barriers to migration.	Restore access to all water courses down to first order streams.
			Distribution of larvae Potential identified	Not less than 50% of sample sites with suitable habitat positive for larval brook/river lamprey.
			Population structure of larvae Potential identified	At least three age/size classes of larval brook/river lamprey present.
			Larval lamprey density in fine sediment Potential identified	Mean density of brook/river larval lamprey in sites with suitable habitat more than 5/ m².
			Extent and distribution of spawning / nursery habitat Potential identified	No decline in extent and distribution of spawning and nursery beds.
Salmon *Salmo salar* [1106]			**Distribution: extent of anadromy** None predicted. The footprint of the Proposed Scheme is not located within any waterbodies that may interfere with access and will not introduce any barriers to migration.	100% of river channels down to second order accessible from estuary.

[33] There are five indicators of overgrazing within 91E0*: topiary effect on shrubs and young trees, browse line on mature trees, abundant dung, severe recent bark stripping, and trampling (NPWS, 2021).

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat (NPWS, 2019d)	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2021; Version 1 03/12/2021)	Target
			Adult spawning fish Potential identified	Conservation limit (CL) for each system consistently exceeded.[34]
			Salmon fry abundance Potential identified	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling.
			Out-migrating smolt abundance Potential identified	No significant decline.
			Number and distribution of redds Potential identified	No decline in number and distribution of spawning redds due to anthropogenic causes.
			Water quality Potential identified	At least Q4 at all sites sampled by EPA.
Otter *Lutra lutra* [1355]			**Distribution** Potential identified	No significant decline.
			Extent of terrestrial habitat Potential identified	No significant decline. Area mapped and calculated as 447.6 ha along river banks/ lake shoreline/around ponds.
			Extent of freshwater (river) habitat None predicted as the Proposed Scheme does not require any in-stream works or direct loss of any freshwater habitat within the River Boyne and River Blackwater SAC. Habitat extent will not be affected.	No significant decline. Length mapped and calculated as 263.3 km.
			Extent of freshwater (lake) habitat None predicted as the Proposed Scheme avoids activity does not interfere with any lake habitat.	No significant decline. Area mapped and calculated as 31.6 ha.
			Couching sites and holts Potential identified	No significant decline.
			Fish biomass available	No significant decline.

[34] A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "*the spawning stock level that produces long term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship*" (NPWS, 2012c).

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat (NPWS, 2019d)	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2021; Version 1 03/12/2021)	Target
			Potential identified	
			Barriers to connectivity Potential identified	No significant decline.

Note: Rows in colour have been brought forward for further consideration and assessment of Conservation Objective attributes.

6.2.1.1 Construction Phase

6.2.1.1.1 Alluvial Forest

6.2.1.1.1.1 Habitat Area and Distribution

Alluvial forest habitat has been screened in for assessment under the conservation attributes '*habitat area'* and '*habitat distribution'* due to potential adverse effects arising during pre-construction archaeological/GI surveys and the construction phase itself. Potential impacts and effects have been identified as a result of surface water run-off (sediment and pollutants) and hydrological effects activities within the flood plain). Adverse effects would be indirect (downstream sedimentation/ pollution/ changes in hydrological and flooding regime).

The Proposed Scheme will not result in any direct loss of alluvial forest habitat as it does not intersect or require the removal of alluvial forest. However, as this habitat is located downstream of the Proposed Scheme (approx. 12.6 km via surface water), there is potential for habitat deterioration through surface water pollution (i.e. sediment and pollutants) and changes in the hydrological regime (i.e. the introduction of temporary coffer dams and bridge construction infrastructure) to alter the dynamic of sediment deposition and therefore the area and distribution of habitat.

As described under **Section 4.6.1**, disruption to hydrological regimes and/or sediment cycles can negatively affect the build-up/replenishment of alluvial sediment. Although the Proposed Scheme may bring about an increase in sediment which may be beneficial to alluvial forest, it is the sediment bound pollutants which may cause adverse effects, reducing habitat quality.

In terms of hydrological regimes, no in-stream works (other than the construction of four outfalls) are proposed within the River Boyne and River Blackwater SAC but works are required to construct the coffer dam and bridge crossing within the flood plain. A detailed flood risk assessment has been completed for the Proposed Scheme (refer to **EIAR Volume 4**, **Appendix 17.2**). The assessment concluded that the impact of both the temporary and permanent works for the Boyne bridge crossing will not have an adverse effect on flooding elsewhere. Therefore, no adverse effects as a result of hydrological changes are predicted to occur (see **Section 6.2.1.2.1.4**).

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out as a result of** the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (sediment and pollutants)** potentially affecting downstream alluvial forest habitat area and distribution during the construction phase.

6.2.1.1.1.2 Woodland Size and Structure

Alluvial forest habitat has been screened in for assessment under the conservation attributes '*woodland size'*, '*woodland structure: cover and height'*, '*woodland structure: community diversity and extent'*, '*woodland structure: natural regeneration*', *'woodland structure: dead wood'*, '*woodland structure: veteran trees'*, and '*woodland structure: indicators of local distinctiveness'* during the pre-construction archaeological/GI surveys and the construction phase itself. Potential impacts and effects have been identified as a result of surface water run-off (sediment and pollutants). Adverse effects would be indirect (downstream sedimentation/ pollution).

As detailed in **Section 6.2.1.1.1.1**, the Proposed Scheme will not cause any direct loss of alluvial forest habitat or significant changes in the hydrological regime. Impacts are associated with sediment bound pollutants, which may adversely affect vegetation, habitat area etc. and therefore woodland size and structure.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (sediment and pollutants)** potentially affecting alluvial forest woodland size and structure during the construction phase.

6.2.1.1.1.3 Vegetation Composition

Alluvial forest habitat has been screened in for assessment under the conservation attributes '*vegetation composition: native tree cover'*, '*vegetation composition: typical species'*, '*vegetation composition: negative*

indicator species', and '*vegetation composition: problematic native species'* during archaeological and GI surveys, and the construction phase. Potential impacts have been identified as a result of surface water run-off (sediment and pollutants) and the spread of IAPS. Adverse effects would be direct (IAPS establishment within alluvial forest habitat) and indirect (downstream sedimentation/ pollution).

As detailed in **Section 6.2.1.1.1.1**, the Proposed Scheme will not cause any direct loss of alluvial forest habitat or changes in the hydrological regime to cause any adverse effects on vegetation composition. Impacts are however associated with sediment bound pollutants and the spread of non-native negative indicator species, which may adversely affect vegetation and habitat area and quality etc., and therefore vegetation composition.

The proposed construction works are located adjacent to a number of areas containing Japanese Knotweed and Himalayan Balsam. In the absence of appropriate mitigation measures, there is potential for the spread of IAPS downstream to alluvial forest habitat, which may out-compete positive indicator species.

In relation to problematic native species, the target is that the cover of common nettle within this habitat is less than 75%. As the Alluvial Forest habitat located downstream of the scheme is periodically inundated by the Boyne waters, nutrient enrichment as a result of water pollution could lead to the dominance of the problematic native species, common nettle[35]. In the absence of appropriate mitigation, there is potential for adverse impacts on site integrity.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (sediment and pollutants) and the spread of IAPS** potentially affecting alluvial forest vegetation composition during the construction phase.

6.2.1.1.1.4 Hydrological Regime

Alluvial forest habitat has been screened in for assessment under the conservation attribute '*hydrological regime: flooding depth/height of water table'* during the construction phase. Potential impacts and effects have been identified as a result of the presence of the Boyne bridge crossing and working areas within the River Boyne flood plain. Adverse effects would be direct (hydrological alterations).

No in-stream works (other than the construction of outfalls) are proposed for the construction of the Boyne crossing however works will be carried out within the flood plain (i.e. proposed outfalls, cofferdams and reno-mattresses) and for the construction of culverts along the mainline (Mattock (Mooretown) stream). The Mattock (Mooretown) stream is located outside the River Boyne and River Blackwater SAC.

A detailed flood risk assessment has been completed for the Proposed Scheme (refer to **EIAR Volume 4**, **Appendix 17.2**). The flood risk assessment found that the proposed bridge will introduce a negligible hydraulic constraint into the River Boyne channel as it achieves significant clearance of approximately 12 m to the river with no footprint located within the main channel while also maintaining the additional 10 m setback to the river channel on both banks. The bridge will require the northern end of the Boyne Valley to be filled in over a distance of approximately 15 m, the increase in flooding risk due to this fill is negligible.

No surface water generated from the Proposed Scheme entering the River Boyne, or other tributaries and drainage ditches that flow into the River Boyne will be of sufficient volume to affect the flooding depth/height of the water table. The assessment concluded that the impact of both the temporary and permanent works for the Boyne bridge crossing will not have an adverse effect on flooding elsewhere. Therefore, no adverse effects on site integrity are predicted to occur.

A series of three culverts will adjoin the existing N2 at the northern tie-in of the Proposed Scheme. The construction directly affects approx. 200 m of the stream, with the 3 no. culverts separated by short sections of realigned channel. Culverts were assessed as part of the detailed flood **r**isk assessment and will not have an adverse effect on flooding elsewhere.

Adverse effects to site integrity **can be ruled out** on alluvial forest as a result of changes in the hydrological regime, alone in the absence of mitigation measures. Therefore, **mitigation is not required** during the construction phase.

[35] Common nettle proliferates and becomes dominant in the presence of increased light and nutrient enrichment (NPWS, 2021).

6.2.1.1.2 River Lamprey

6.2.1.1.2.1 Distribution

River lamprey has been screened in for assessment under the conservation attribute '*distribution of larvae'* during archaeological and GI surveys, and the construction phase. Potential impacts have been identified as a result of surface water run-off (sediment and pollutants). Adverse effects would be direct (hydroacoustic noise effects, disturbance and local smothering) and indirect (downstream sedimentation/ pollution). Juvenile river lamprey are considered likely to be present in the marginal silt deposits of the River Boyne in the ZoI.

Water Quality

River lamprey spawn in clean gravel/cobble areas from which larvae (ammocoetes) hatch and then drift downstream to find suitable muddy or silty parts of the riverbed where they burrow and live for several years. Lamprey nursery areas are less likely to be significantly adversely affected by small amounts of sedimentation because ammocoetes require areas of silt deposition during their nursery stage. However, the River Boyne would be at risk from any uncontrolled sediment loss and release of pollutants during the construction phase.

During the construction of the Boyne crossing, attenuation/settlement ponds are intended to be fully operational prior to the main construction phase, with bare ground allowed to re-vegetate or to be re-sodded. This will greatly reduce the risk of untreated or uncontrolled discharges entering surface waters. However, where cofferdam areas are installed and constructed, they will be subject to constant water ingress (as works are essentially below the water table) and will need to be pumped-out to create dry working conditions. Therefore, in the absence of robust mitigation in the area of sediment control in particular, plus careful management of engineering works and monitoring of mitigation measures, there is potential for adverse effects on site integrity.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (sediment and pollutants)** potentially affecting the distribution of river lamprey (larvae) during the construction phase.

Light Pollution

In relation to artificial lighting, construction works, in general, will be undertaken during normal daylight working hours. However, some temporary, intermittent and short-term night time work is expected (i.e. critical lifts associated with the bridge construction). There is potential for artificial lighting associated with the construction of the Proposed Scheme to spill onto the River Boyne during hours of darkness. Light spill onto the River Boyne channel during the hours of darkness has the potential to illuminate the riverine and riparian habitats within this SAC which are used by lamprey. In the absence of appropriate control and mitigation measures, this could potentially cause temporary displacement and affect the distribution of the nocturnal QI River Lamprey.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to control artificial lighting (light spill)** potentially affecting the distribution of river lamprey (larvae) during the construction phase.

6.2.1.1.2.2 Population Structure of Larvae / Larval Lamprey Density

Artificial Lighting

In relation to artificial lighting, construction works, in general, will be undertaken during normal daylight working hours. However, some temporary, intermittent and short-term night time work is expected (i.e. critical lifts associated with the bridge construction). There is potential for artificial lighting associated with the Proposed Scheme to spill onto the River Boyne during hours of darkness. Light spill onto the River Boyne channel during the hours of darkness has the potential to illuminate the riverine and riparian habitats within this SAC which are used by lamprey. In the absence of appropriate control and mitigation measures, this could form a barrier to the movement of the nocturnal QI River Lamprey.

Potential impacts are predicted to be the same as those detailed in Section **6.2.1.2.2.1**. Therefore, in the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed

Scheme. Therefore, **mitigation is required in order to prevent impacts on artificial lighting** potentially affecting the population structure and density of river lamprey larvae during the construction phase.

6.2.1.1.2.3 Extent and Distribution of Spawning and Nursery Habitat

River lamprey has been screened in for assessment under the conservation attribute '*extent and distribution of spawning nursery habitat'* during archaeological and GI surveys, and the construction phase. Potential impacts have been identified as a result of surface water run-off (sediment and pollutants) and air pollution. Adverse effects may be direct (local smothering) and/or indirect (downstream sedimentation/ pollution) in the event that large amounts of uncontrolled sediment escapement occurred, noting that this is very unlikely given the detailed, phased construction approach that forms part of the Proposed Scheme.

It is presumed on a precautionary basis that that there is some suitable habitat for river lamprey spawning, particularly downstream of the proposed bypass crossing near the dilapidated weir on the River Boyne. Lamprey nursery habitat is present in pockets along the river margin where silt accumulates. Lamprey nursery areas are less likely to be significantly adversely affected by small amounts of sedimentation, since juveniles require silt deposits, but excessive uncontrolled sediment release could damage spawning areas and have a smothering effect on existing silt deposition areas, thereby altering the extent and distribution of available habitat.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (sediment and pollutants) and air pollution** potentially affecting the extent and distribution of river lamprey spawning nursery habitat during the construction phase.

6.2.1.1.3 Salmon

6.2.1.1.3.1 Adult Spawning Fish

Salmon has been screened in for assessment under the conservation attribute '*adult spawning fish'* during archaeological and GI surveys, and the construction phase. Potential impacts have been identified as a result of surface water run-off (sediment and pollutants), air pollution, noise emissions and artificial lighting (disturbance). Adverse effects may be direct (noise hydroacoustic effects, disturbance and local smothering) and indirect (downstream sedimentation/ pollution).

As detailed in **Section 4.3.4**, although limited spawning grounds for Salmon have been noted within the main channel of the Boyne, salmon migrate both upstream and downstream through the potentially affected Slane reach. Impacts on both adult fish and (as a precaution) spawning grounds are considered here.

Water Quality

Adult salmon are expected to have some tolerance to naturally high suspended sediment concentrations, given their migration routes typically pass through estuarine habitats which have background suspended sediment concentrations which are considerably higher than those expected in offshore areas. However, turbidity and/or sedimentation of spawning or nursery areas can have a negative effect on salmon recruitment through behavioural, physiological and physical mechanisms.

The scale of earthworks, structures and drainage features involved means there is potential for the release of sediment and pollutants during the construction phase; including in the vicinity of the River Boyne and River Blackwater SAC where temporary cofferdam working areas will be constructed in order to facilitate the piling of bridge piers.

At worst, excessive sediment release may cause sedimentation in near downstream areas where salmon parr may be foraging. Localised turbidity could affect visibility of prey in the water column and/or cause physical abrasion of salmon gills and affect respiration. In reality, salmon are likely to avoid areas of localised turbidity, temporarily seeking alternative foraging areas.

Cofferdam areas will be subject to constant water ingress for the proposed bridge crossing and proposed culverting and channel realignments along the Mattock (Mooretown) Stream. If not appropriately attenuated and treated this may give rise to increased sediment and pollutants downstream. In the absence of robust mitigation, careful management of engineering works and monitoring of mitigation measures there is potential for adverse effects on site integrity.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (sediment and pollutants)** potentially affecting the distribution of salmon during the construction phase.

Noise Emissions

Pile driving is required as part of bridge pier foundation construction. This is on a salmon migration route in and out of the catchment. The central and northern piers are located just over 10 m from the Boyne river banks, each requiring 14 foundation piles (approximate diameter 1,200 mm). Ground borne sound and vibration can result in wave propagation through substrates that produce sound pressure waves and particle motion in water.

The available evidence shows that fish hear via mechanisms responding to both sound pressure and particle motion (Popper & Hawkins, 2019). With regard to salmon, salmon have a swim bladder that is relatively distant from the ear and are therefore primarily sensitive to particle motion (as opposed to sound pressure), resulting in reasonably narrow hearing bandwidth.

The hydroacoustic noise assessment has been completed as part of the Proposed Scheme, which notes that bored piling and press-in piling techniques are low impact methodologies. The results at the nearby River Boyne show: 132 dB re 1 µPa [Peak]; 159 dB re 1 μPa^2-s [Sound Exposure Level/ SEL (24 hour)] and 113 dB re 1 µPa [Root Mean Square/ RMS]. The results are conservatively based on a 50% duty cycle over 24 hours. The critical exposure period (i.e. relating to piling of central and north piers) would potentially last for 14 days (estimated as one day needed per pile installation, times 14 piles per pier) on each side of the Boyne main channel, resulting in a total of approximately 28 days times 8 hours. There would be a gap during this period while the drilling rig is moved from one side of the channel to the other. The sound source is therefore continuous while in operation but intermittent and temporary. Furthermore, the sound source is stationary and the channel width is 40 m, meaning there would at all times be a section of the channel much less affected by underwater noise associated with piling. Ambient noise levels within the Boyne will already be elevated owing to its swift, turbulent nature in the crossing reach.

It is estimated that mild avoidance reactions will occur for salmon that happen to pass nearby the pile driving sound source. In summary, impacts on this freshwater fish species is predicted to be temporary and very minor for relatively small numbers of localised individuals and certainly not significant at a population level. The most likely fish response is avoidance, meaning individuals can move laterally or longitudinally in the large channel to escape and reduce stress.

With respect to noise emissions, **Adverse effects to site integrity are not predicted** from the Proposed Scheme alone in the absence of mitigation measures. Therefore, **mitigation is not required** during the construction phase.

Artificial Lighting

In relation to artificial lighting, construction works, in general, will be undertaken during normal daylight working hours. However, some temporary, intermittent and short-term night time work is expected (i.e. critical lifts associated with the bridge construction). There is potential for artificial lighting associated with the Proposed Scheme to spill onto the River Boyne during hours of darkness. Light spill onto the River Boyne channel during the hours of darkness has the potential to illuminate the riverine and riparian habitats within this SAC which are used by salmon. In the absence of appropriate control and mitigation measures, this could form a barrier to the movement of the nocturnal QI Salmon.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to control artificial lighting (light spill)** potentially affecting the distribution of salmon during the construction phase.

6.2.1.1.3.2 Salmon Fry and Out-migrating Smolt Abundance

Salmon has been screened in for assessment under the conservation attributes *'salmon fry abundance'* and *'out-migrating smolt abundance* during archaeological and GI surveys, and the construction phase*'*. Potential impacts have been identified as a result of surface water run-off (sediment and pollutants) and air pollution (dust). Adverse effects would be direct disturbance and indirect (downstream sedimentation/ pollution).

Salmon fry would only be likely to occur in the Mattock main channel upstream of the SAC boundary. Small numbers of fry may be subject to sediment effects if there was uncontrolled construction activity on the Mooretown Stream (4km upstream of the Mattock). The Proposed Scheme has the potential to smother clean gravels of the lower Mattock River and presumed to be cause some limited mortality owing to

sedimentation. The Mattock is upstream of the SAC but contribute salmon to the system and therefore supports COs of the SAC. Fry are not expected to be present in the ZoI on the main channel of the River Boyne, and if so, only in very low abundance. The potential impact on fry in the main channel of the Boyne is not significant. Out-going smolt will not be affected by the Proposed Scheme.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (sediment and pollutants) and air pollution (dust)** potentially affecting the salmon fry and out-migrating smolt abundance during the construction phase.

6.2.1.1.3.3 Number and Distribution of Redds

Salmon has been screened in for assessment under the conservation attribute *'number and distribution of redds'* during archaeological and GI surveys, and the construction phase. Potential impacts have been identified as a result of surface water run-off (sediment and pollutants) and air pollution. Adverse effects would be direct (local smothering) and indirect (downstream sedimentation/ pollution).

There are limited spawning grounds (i.e. gravels) for salmon within the main channel of the River Boyne between Drogheda and Navan, as detailed in **Section 4.3.4**. Spawning redds are likely to be present in the Mattock River, upstream of the SAC boundary, but these redds support the COs for salmon of the downstream SAC. On this basis, it is presumed that there is at least some, very limited, suitable habitat within the ZoI of the Proposed Scheme. Bearing this in mind in line with the CO target for salmon to ensure no decline in number and distribution of spawning redds due to anthropogenic causes, mitigation measures should be put in place to prevent a decline in water quality and subsequently the distribution and number salmon redds.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (sediment and pollutants) and air pollution** potentially affecting the number and distribution of salmon redds during the construction phase.

6.2.1.1.3.4 Water Quality

Salmon has been screened in for assessment under the conservation attribute *'water quality'* during archaeological and GI surveys, and the construction phase. Potential impacts have been identified as a result of surface water run-off (sediment and pollutants). Adverse effects would be indirect (downstream sedimentation/ pollution).

The target of this conservation objective is to ensure that watercourses sampled by the EPA remain at, at least a Q4 for biological water quality. The Proposed Scheme supports connectivity to several drainage ditches, the Mattock (Mooretown) stream and the River Boyne and its tributaries. At present, the status of those sampled by the EPA and that intersect the Proposed Scheme are as follows; River Boyne (Q4) and River Mattock (Q4). As there is potential for the construction of the Proposed Scheme in the absence of mitigation measures to cause a decline in river water quality linked to escapement of suspended solids which can alter physical instream habitats for the macroinvertebrate fauna that define ecological status, an adverse impact on site integrity cannot be ruled out.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (sediment and pollutants)** potentially affecting salmon during the construction phase.

6.2.1.1.4 Otter

6.2.1.1.4.1 Distribution

Otter has been screened in for assessment under the conservation attribute *'distribution'* during archaeological and GI surveys, and the construction phase. Potential impacts and effects have been identified as a result of surface water run-off (sediment and pollutants), noise emissions, artificial lighting (disturbance) and accidental killing/injury. Adverse effects would be direct (killing/injury, disturbance and local smothering) and indirect (downstream sedimentation/ pollution impacting on habitat and food resources).

As detailed in **Section 4.3.5**, based on field survey findings otter are foraging and/or commuting along the River Boyne corridor within, adjacent and upstream/downstream of the Proposed Scheme. Field evidence also indicates that otter commute along the Mattock (Mooretown) stream. Although this stream provides connectivity with the River Boyne, the quality of habitat within the Mattock is considered to be much lower (i.e. poor water quality status and poor riparian habitat quality) than that of the River Boyne (i.e. good water quality status and good riparian habitat quality). Within the Mattock stream, the availability of resources to support otter are limited and would be much less attractive for foraging purposes.

With respect to otter, the Proposed Scheme will not result in the direct loss of any known breeding or resting sites based on the current baseline. Therefore there is no direct adverse effect on such features. However, otters are mobile species in a dynamic environment and therefore pre-cautionary measures are included within the mitigation proposed to ensure that the baseline in advance of construction works is updated.

Given that otters are known to be active along the River Boyne, in the absence of mitigation, there is a risk of otter being killed or injured during the construction activities e.g. as a result of falling into open excavations. It is considered in the absence of mitigation measures, that such impacts could affect the population of otters locally.

The Proposed Scheme has the potential to cause a decline in water quality which may indirectly affect food sources (i.e. fish) available to otter, therefore affecting their distribution within the River Boyne. As there is potential for surface water pollution of both the River Boyne and the Mattock (Mooretown) stream to indirectly affect otter food supply, in the absence of mitigation measures, an adverse impact on site integrity cannot be ruled out.

The Proposed Scheme also has the potential to cause disturbance to commuting and foraging otter using the River Boyne and associated flood plain. Disturbance as a result of the construction footprint within the floodplain of the River Boyne includes excavations, platform formation, cofferdam installation and operation, piling and bridge installation, machinery and artificial lighting may affect east/west otter movement along the Boyne valley. East-west otter movement along the River Boyne will be restricted to a 10 m buffer either side of the river during the construction period. However, otter are most active at dusk and dawn and although works are to be completed during the day, there will also be some intermittent night time working. Mindful of the typical activity habitats of otter, the River Boyne will continue to provide a functional corridor for the movement of otter. It is not considered that this will significantly alter the accessibility of otters up and downstream along the Boyne although there will be short periods of disruption during the construction phase particularly during the intermittent night time working. Furthermore, given the current use of the environment surrounding the River Boyne, otter populations in the area are considered to already be habituated to presence of human activity and noise within the environment (i.e. anthropogenic factors). Although, the potential localised displacement as a result of disturbance impacts to commuting and foraging otter would be limited to local level for the duration of construction, adverse impacts may arise during the construction period within the floodplain of 33 months.

There is also potential for artificial lighting associated with the Proposed Scheme to spill onto the River Boyne during hours of darkness (i.e. during critical lifts associated with the bridge construction). Light spill onto the River Boyne channel during the hours of darkness has the potential to illuminate the riverine and riparian habitats within this SAC which are used for foraging and commuting by QI otter. In the absence of appropriate control and mitigation measures, this could form a barrier to the movement of nocturnal QI species.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts associated with water quality (sediment and pollutants), accidental killing/injury, noise emissions and artificial lighting** potentially affecting otter distribution during the construction phase.

6.2.1.1.4.2 Extent of Terrestrial Habitat

Otter has been screened in for assessment under the conservation attribute *'extent of terrestrial habitat'* during the construction phase. The Proposed Scheme will result in both the permanent and temporary loss of terrestrial habitat as a result of the proposed Boyne crossing. Adverse effects would be direct.

Otters are evidenced as using watercourses throughout the study area, particularly along the River Boyne and its proximal complex of wetland habitats which support suitable feeding and commuting habitat. Otters do not limit their movements to watercourse and can use adjacent areas (e.g. the wider floodplain) in search for prey species, such as amphibians where available.

In terms of permanent terrestrial habitat loss, which is potentially used by otter, impacts will not result in any significant loss of terrestrial habitat. This is due to its clear span design for the River Boyne crossing and a setback of 10 m from both the northern and southern riverbank. Instream works will be required within the Mattock (Mooretown) stream with a direct footprint on habitat potentially used by commuting otter.

In terms of temporary terrestrial habitat loss, which is potentially used by otter, impacts are associated with the use working platforms to facilitate bridge pier foundation construction; including the provision of cofferdams. Cofferdams, in order to fulfil their required function, will involve the removal of any spoil and water- which will involve temporary loss of habitat used by otter. Once the piles are installed and the piers are constructed, cofferdams and working platforms will be removed. In the absence of mitigation to ensure backfilling, re-vegetating and rehabilitation of habitat lost within the SAC as a result of cofferdams and working platforms, adverse effects to site integrity cannot be ruled out.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on the extent of terrestrial habitat** potentially used by otter during the construction phase.

6.2.1.1.4.3 Couching Sites and Holts

Otter has been screened in for assessment under the conservation attribute *'couching sites and holts'* during the construction phase. There were no confirmed couching or resting sites recorded during field surveys within or adjacent to the footprint of the Proposed Scheme. Based on the existing baseline, no couching or holt sites will be lost and there will be no adverse impact on integrity with respect to this attribute. However, otters are mobile species occupying dynamic riverine systems and therefore the baseline can change over time. As a precautionary mitigation measure, a pre-construction survey for otter will be carried out within and adjacent to the footprint of the Proposed Scheme in order to identify any new territories and the establishment of any new holt or couching sites in the intervening period.

6.2.1.1.4.4 Fish Biomass Available

Otter has been screened in for assessment under the conservation attribute *'fish biomass available'* during archaeological and GI surveys, and the construction phase. Potential impacts have been identified as a result of air pollution (dispersion of construction dusts) and surface water run-off (sediment and pollutants). Adverse effects would be direct (local smothering) and indirect (downstream sedimentation/ pollution).

The scale of earthworks, structures and drainage features involved means there is widespread potential for the release of sediment and pollutants during the construction phase; including in the vicinity of the River Boyne and River Blackwater SAC where temporary cofferdam working areas will be constructed in order to facilitate the piling of bridge piers.

The Proposed Scheme is not expected to directly affect the availability of fish biomass through its footprint (small fish, aquatic insects and freshwater shrimp) as there is no requirement for instream works (i.e. the Proposed Scheme adopts a clear span bridge over the river channel) and will further adopt a set-back zone of 10 m from the river bank (of which no works will be permitted within). Elevated concentrations of pollutants, suspended solids, and resulting turbidity within the water column can damage the gills, physiology and behaviour of fish (e.g. respiration, migration) and/or aquatic insects and macroinvertebrates as well as cause a decline in water quality.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts associated with water quality (sediment and pollutants)** and **air pollution (dust)** and consequently fish biomass available, potentially affecting otter distribution during the construction phase.

6.2.1.1.4.5 Barriers to Connectivity

Otter has been screened in for assessment under the conservation attribute *'barriers to connectivity'* during the construction phase. Potential impacts have been identified as a result of displacement (specifically the construction of the proposed bridge crossing and associated works) on otter, which are known to be commuting and foraging in the area. Barriers to connectivity come potentially in the form of the physical presence of the bridge itself, noise/vibration emissions (which includes human presence) and artificial lighting. Adverse effects would be direct.

Fundamentally, a new road/bridge crossing of a river can potentially result in a barrier effect to species moving along the affected watercourse and riparian habitats either side. Such barrier effects can prevent or alter the movement of species along the watercourse. However, the barrier effect can be significantly reduced through the design of the bridge crossing.

In the case of the proposed bridge crossing, this adopts a four-span bridge design with a deck which is 12m above median river level. There are no construction works within 10m of the river and no in river works.

During construction, there will be a period of 33 months where construction works will be located within the floodplain of the River Boyne and fencing will be erected to prevent otter access into those working areas. At that time, the passage of otters will, temporarily, be restricted to the River Boyne itself and a 10m buffer either side. Given that there are no overnight construction works proposed (except for where temporary night time working is required for critical bridge lifts) and mindful of the typical activity habitats of otter, the River Boyne will continue to provide a functional corridor for the movement of otter. It is not considered that this will significantly alter the accessibility of otters up and downstream along the Boyne. This includes accessibility to places of refuge and foraging resources.

Once constructed, the bridge will have a no significant barrier effect to the movement of otter along the River Boyne and the habitats either side due to the design which has been adopted. In light of the above, there will be no permanent barrier effect to otter from the proposed river crossing and no adverse effect on site integrity with respect to this species.

The proposed bridge works will still however be a source of noise/vibration emissions as a result of bored pile capped foundations which support piers and artificial lighting required to complete the construction phase (i.e. intermittent, temporary and short term night time working may be required for critical lifts associated with the bridge construction), which may cause a barrier to commuting and foraging otter resulting in displacement.

Artificial lighting has the potential to disrupt natural patterns of light and dark and impact upon the normal foraging activities of nocturnal mammals (BCT, 2014). Although the potential impacts of disturbance resulting in a barrier to connectivity to commuting and foraging otter would be limited to a local level for the duration of construction and considered short term and temporary, adverse impacts may arise during the construction period of 36 months.

In the absence of mitigation, adverse effects to site integrity cannot be ruled out as a result of the Proposed Scheme. Therefore, mitigation is required in order to ensure noise emissions and artificial lighting will not cause barriers to connectivity to commuting and foraging QI otter during the construction phase.

6.2.1.2 Operational Phase

6.2.1.2.1 Alluvial Forest

6.2.1.2.1.1 Habitat Area and Distribution

Alluvial forest habitat has been screened in for assessment under the conservation attributes '*habitat area'* and '*habitat distribution'* during the operational phase. Potential impacts are similar to those as described in **Section 6.2.1.1.1.1**. Adverse effects would be indirect (downstream sedimentation/ pollution/ changes in hydrological and flooding regime).

The Proposed Scheme will not cause any direct loss of alluvial forest (i.e. the Proposed Scheme and this QI habitat do not overlap). However, as this habitat is located downstream of the Proposed Scheme (approx. 12.6 km via surface water), there is potential for habitat deterioration through surface water pollution (i.e. sedimentation and nutrients). Habitat deterioration can then contribute to a decline in habitat area and habitat distribution which may cause an adverse effect on site integrity.

The presence of attenuation ponds/wetlands will greatly reduce the risk of untreated or uncontrolled discharges entering the watercourses during the operational phase and the Proposed Scheme provides for a treatment train incorporating grassed channels, vortex grit separators and petrol/oil interceptors (together with the management and maintenance of these structures). With these standard drainage measures in place as part of the design of the Proposed Scheme, runoff will be treated and any sediment will be captured and retained before final discharge to a watercourse.

In terms of hydrological regimes during the operational phase, a detailed flood risk assessment has been completed for the Proposed Scheme (refer to **EIAR Volume 4**, **Appendix 17.2**). The assessment concluded

that the presence the Boyne bridge crossing and culverts within the Mattock (Mooretown) stream will not have an adverse effect on flooding elsewhere. Therefore, no adverse effects as a result of hydrological changes are predicted to occur.

During the operational phase, run-off will be directed via attenuation basins and other road drainage features, which will remove significant sources of unattenuated road run-off pollution as part of the design of the Proposed Scheme. **Measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance, mindful of the ecological sensitivity of the River Boyne.

6.2.1.2.1.2 Woodland Size and Structure

Alluvial forest habitat has been screened in for assessment under the conservation attributes '*woodland size'*, '*woodland structure: cover and height'*, '*woodland structure: community diversity and extent'*, '*woodland structure: natural regeneration*', *'woodland structure: dead wood'*, '*woodland structure: veteran trees'*, and '*woodland structure: indicators of local distinctiveness'*. Potential impacts have been identified as a result of surface water run-off (sediment and pollutants). Adverse effects would be indirect (downstream sedimentation/ pollution).

As detailed in **Section 6.2.1.2.1.1**, the Proposed Scheme will not cause any direct loss of alluvial forest woodland size or structure (i.e. the Proposed Scheme and this QI habitat do not overlap). However, as this habitat is located downstream of the Proposed Scheme (approx. 12.6 km) and is periodically inundated by the annual rise of river levels, pollution during the operational phase of a significant magnitude could potentially negatively affect the water quality of this habitat, therefore impacting vegetation, woodland size and structure. As detailed in **Section 6.2.1.2.1.1** above, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible.

No impacts as a result of hydrological regime (i.e. the introduction of bridge infrastructure) (see **Section 6.2.1.2.1.4**) are predicted to occur on woodland size and structure.

During the operational phase, run-off will be directed via attenuation basins and other road drainage features, which will remove significant sources of unattenuated road run-off pollution as part of the design of the Proposed Scheme. **Measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

6.2.1.2.1.3 Vegetation Composition

Alluvial forest habitat has been screened in for assessment under the conservation attributes '*vegetation composition: native tree cover'*, '*vegetation composition: typical species'*, '*vegetation composition: negative indicator species'*, and '*vegetation composition: problematic native species'* during the operational phase. Potential impacts have been identified as a result of surface water run-off (sediment and pollutants) and the spread of IAPS. Adverse effects would be direct (IAPS establishment within alluvial forest habitat) and indirect (downstream sedimentation/ pollution).

In terms of native tree cover and typical species, operational impacts are similar to those as detailed above in **Section 6.2.1.2.1.2**. As this habitat is periodically inundated by the annual rise of river levels, pollution during the operational phase of a significant magnitude and changes in the hydrological regime could potentially negatively affect the water quality and periodic inundation of this habitat, therefore impacting vegetation, tree cover and species present.

In relation to negative indicator species (i.e. any non-native species), the target is that they should be absent or in control within QI Alluvial forest habitat. The operational footprint of the Proposed Scheme is not located within or adjacent to this habitat type or within any locations where invasive plant species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 201, as amended occur. Although the Proposed Scheme is located adjacent to a number of locations of Japanese Knotweed and Himalayan Balsam (particularly in proximity to the existing Slane bridge), the spread of IAPS downstream to Alluvial forest habitat is not likely to occur owing to the nature of operational activities. This is in the absence of mitigation measures.

In relation to problematic native species, the target is that the cover of common nettle within this habitat is less than 75%. Impacts on water quality (incl. indirect impacts via pollution of the groundwater which meet

surface water bodies), if they were to occur in a significant magnitude could result in the nutrient enrichment of the River Boyne. As the Alluvial Forest habitat located downstream of the scheme is periodically inundated by the Boyne waters, nutrient enrichment could lead to the dominance of the problematic native species, common nettle.[35]

However, as detailed in **Section 6.2.1.2.1.1** above, the presence of attenuation ponds/wetlands and incorporation of grassed channels, vortex grit separators and petrol/oil interceptors in place as part of the design of the Proposed Scheme, will treat and capture sediment and run-off before final discharge to a watercourse. With measures such as these in place, any pollution arising from the Proposed Scheme during the operational phase is considered negligible. **Measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

6.2.1.2.1.4 Hydrological Regime

Alluvial forest habitat has been screened in for assessment under the conservation attribute '*hydrological regime: flooding depth/height of water table'* during the operational phase.

No surface water generated from the Proposed Scheme entering the River Boyne, or other tributaries and drainage ditches that flow into the River Boyne will be of sufficient volume to affect the flooding depth/height of the water table. During operation of the River Boyne bridge crossing, a similar case is true. The proposed bridge will introduce a negligible hydraulic constraint into the River Boyne channel as it achieves significant clearance of approximately 12 m to the river with no footprint located within the main channel while also maintaining the additional 10 m setback to the river channel on both banks. The bridge will require the northern end of the Boyne Valley to be filled in over a distance of approximately 15 m, the increase in flooding risk due to this fill is negligible. Therefore, no adverse effects on site integrity are predicted to occur.

Poorly designed crossing structures and insufficient storm water discharge attenuation can also disrupt natural river hydraulics leading to increased erosion and flooding as a result of flow changes. Poorly maintained culverts can encourage blockage by debris and problems with fish passage through structures (Cocchiglia et al., 2012).

In this regard, it is first noted that appropriately sized attenuation ponds (with hybrid wetlands) will be provided at all major surface water outfalls along the length of the road scheme, designed in accordance with DN-DNG-03063 Vegetated Drainage Systems for Road Runoff and DN-DNG-03065 Road Drainage and the Water Environment. These are designed to accommodate and contain flows from a 1% AEP (1 in 100 year) rainfall event, taking into account the effects of climate change on rainfall.

Secondly, the series of Mattock (Mooretown) culverts have been sized and positioned according to pre-existing natural topographical fall and stream flow and are of specification required to meet requirements for Section 50 consent, specifically that they are capable of passing a fluvial flood flow of 1% AEP without significantly changing the hydraulic characteristics of the watercourse.

Adverse effects to site integrity can be ruled out as a result of the Proposed Scheme. Therefore, **mitigation is not required** during the operational phase.

6.2.1.2.2 River Lamprey

6.2.1.2.2.1 Distribution of Larvae

River lamprey has been screened in for assessment under the conservation attribute '*distribution of larvae'* during the operational phase. Potential impacts have been identified as a result of surface water run-off (sediment and pollutants), artificial lighting (specifically the proposed bridge crossing) and bridge shading. Adverse effects would be direct (disturbance, habitat deterioration) and indirect (downstream sedimentation/ pollution).

Water Quality

As detailed in **Section 4.3.3**, it is presumed, on the basis of habitat suitability and previous studies, that river lamprey larvae occur in the River Boyne in the ZoI. River lamprey may spawn in patches of coarse substrate near the dilapidated weir especially if they cannot ascend weirs further upstream. Larval lamprey, spawned upstream, are almost certainly present in suitable muddy or silty parts of the river margins near the proposed bypass crossing point. Pollution events can impact on larvae by smothering either spawning sites or nursery silts.

Given the scale of structures and drainage features involved, there is potential for the release of sediment and pollutants during the operational phase. Operational phase run-off will be directed via attenuation basins containing sections of constructed surface flow wetlands, planted with appropriate native aquatic vegetation. The Proposed Scheme design also provides for a treatment train incorporating grassed channels, vortex grit separators and petrol/oil interceptors. As such, these attenuation ponds/wetlands and drainage features will treat the run-off from the roadway before it is directed to the River Boyne (and the Mattock (Mooretown) stream). It is noted there is potential for water quality improvement of the River Boyne, which may arise by introducing modern road drainage features and removing significant sources of unattenuated (and consequently untreated) road run-off pollution from existing road surfaces that currently have inferior or no drainage treatment which would otherwise remain as sources of potential operational phase impact as traffic volumes increase into the future.

Maintenance activities will largely include visual inspections from the mainline, from ground level below the bridge and by boat. Surface drainage maintenance will be the most frequent task and ensures drainage structures are functioning as intended. Aggregation of silt captured within drainage during cleaning may bring about increases in the siltation of surface water, but are not considered to result in adverse effects.

During the operational phase, run-off will be directed via attenuation basins and other road drainage features, which will remove significant sources of unattenuated road run-off pollution as part of the design of the Proposed Scheme. **Measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

Artificial Lighting

Artificial lighting during the operational phase is associated with artificial illumination of the Proposed Scheme. For river lamprey, this specifically relates to the River Boyne corridor which is intersected by the proposed bridge crossing. However, light spill along the River Boyne corridor and any subsequent effects on the distribution of river lamprey shall not occur, owing to the fact that the proposed bridge crossing is to remain unlit during the operational phase. As there is no pathway of effect for the Proposed Scheme to illuminate the riverine and riparian habitats within this SAC which are used for foraging and commuting by river lamprey, **adverse effects to site integrity can be ruled out.** Therefore, no **mitigation is required.**

Bridge Shading

Instream plants require light to conduct photosynthesis, propagate and survive, in turn affecting aquatic macroinvertebrate production and fish productivity. On the other hand, shade can be highly beneficial to rivers and streams through regulation of water temperature and provision of physical cover to instream organisms. Shade, for example, is suggested as a potential management strategy to mitigate climate-change induced instream water temperature increases in UK river catchments (Johnson & Wilby, 2015) and to improve water quality conditions in small and moderate-size watercourses that are exposed to excessive algal growth during summer periods (Ghermandi *et al.*, 2009).

The proposed N2 Slane Bypass bridge deck over the Boyne is approximately 23.55 m wide and 12.0 m above median river level at the crossing point. The bridge orientation is north-south, with a wide, generally open, locally treeless floodplain to the east and west. This means that, other than the elevated bridge structure itself, incident solar radiation to the Boyne channel would not be otherwise obstructed. Light incidence would still occur upon most of the channel beneath the bridge at various times throughout the day as a function of the changing angles of solar radiance moving east-west (with low angles morning and evening), in contrast to the north-south bridge orientation. Overall, there will be beneficial microclimates created in small areas for fish, which often show preference for shaded (covered) river habitats.

Adverse effects to site integrity can be ruled out from the Proposed Scheme alone in the absence of mitigation measures. Therefore, **mitigation is not required.**

6.2.1.2.2.2 Population Structure of Larvae

River lamprey has been screened in for assessment under the conservation attribute '*population structure of larvae'* during the operational phase. As detailed in **Section 4.3.3**, river lamprey (mainly juveniles burrowed into marginal sediments) are likely to occur within the ZoI on the River Boyne.

During the operational phase, potential impacts could only be related to changes to water quality and/or sediment supply leading to excessive sedimentation and anoxia in marginal river habitats. Given the detailed drainage measures incorporated into the design of the Proposed Scheme, there is expected to be a net improvement in water quality associated with modern drainage features designed into the Proposed Scheme, including attenuation ponds / hybrid wetlands which attenuate and treat any associated road

surface run-off pollutants. The Proposed Scheme also has a very low predicted daily traffic flow which does not lead to high source levels of potential road surface run-off pollutants. In addition, **measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

Adverse effects to site integrity can be ruled out from the Proposed Scheme alone in the absence of mitigation measures. Therefore, **mitigation is not required**.

6.2.1.2.2.3 Larval Lamprey Density

River lamprey has been screened in for assessment under the conservation attribute '*larval lamprey density in fine sediment'* during the operational phase. As detailed in **Section 4.3.3**, river lamprey are likely to occur within the ZoI on the River Boyne.

During the operational phase, potential impacts could only be related to changes to water quality and/or increased sediment supply leading to excessive sedimentation and anoxia in marginal river habitats. Given the detailed drainage measures incorporated into the design of the Proposed Scheme, there is expected to be a net improvement in water quality associated with modern drainage features designed into the Proposed Scheme, including attenuation ponds / hybrid wetlands which attenuate and treat any associated road surface run-off pollutants. The Proposed Scheme also has a very low predicted daily traffic flow which does not lead to high source levels of potential road surface run-off pollutants. In addition, **measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

Adverse effects to site integrity can be ruled out from the Proposed Scheme alone in the absence of mitigation measures. Therefore, **mitigation is not required**.

6.2.1.2.2.4 Extent and Distribution of Spawning and Nursery Habitat

River lamprey has been screened in for assessment under the conservation attribute '*extent and distribution of spawning/ nursery habitat'* during the operational phase. Potential impacts are associated with run-off from drainage systems (i.e. sediment, hydrocarbons, heavy metals), attenuation ponds, and the spread of invasive alien plant species (i.e. affecting river margin habitat used by larvae). Excessive sediment and pollutants (hydrocarbons) could reduce quality of nursery silt beds causing a decline in their extent and distribution, although this is considered very unlikely owing to the level of attenuation provided by the design.

In relation to invasive alien plant species, the operational footprint of the Proposed Scheme is not located within any locations where invasive plant species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations, 2011, as amended occur. Although the Proposed Scheme is located adjacent to a number of locations of Japanese Knotweed and Himalayan Balsam (particularly in proximity to the existing Slane bridge), the spread of IAPS is not likely to occur owing the nature of operational activities. This is in the absence of mitigation measures. As detailed in **Section 4.3.3**, river lamprey are likely to occur as there is suitable nursery habitat within the ZoI on the River Boyne. During the operational phase, run-off will be directed via attenuation basins and other road drainage features, which will remove sources of unattenuated road run-off pollution as part of the design of the Proposed Scheme. **Measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

6.2.1.2.3 Salmon

6.2.1.2.3.1 Adult Spawning Fish

Salmon has been screened in for assessment under the conservation attribute '*adult spawning fish'*. As detailed in **Section 4.3.4**, although limited spawning grounds for Salmon have been noted within the main channel of the Boyne, adults migrate through the ZoI of the Proposed Scheme, including through the proposed bridge location, and are known to spawn in the Mattock River, upstream of the SAC boundary. During the operation of the Proposed Scheme, impacts could be associated with the potential release of typical road surface run-off pollutants, including sediment, heavy metals and hydrocarbons.

The main factors influencing contaminant concentration in run-off are considered to be Annual Average Daily Traffic (AADT) and rainfall regime (volume, duration and antecedent conditions) (TII, 2015). Most research has focused on road run-off impacts in relation to roads carrying much higher traffic volumes than the

proposed bypass. But it is not possible to identify a traffic volume that would be considered so low that any adverse impact could be entirely ruled out (e.g. Huber et al., 2016). Irish national roads produce run-off with similar characteristics to those in the UK where studies have shown in that, in the absence of treatment, impact on water quality can be expected from highways with >30,000 AADT, although AADT of >15,000 has been proposed as a traffic density that could be of concern (Bruen et al., 2006). The design year (2041) AADT for the Proposed Scheme is just 11,800 vehicles over the proposed Slane bypass bridge.

The Proposed Scheme leads to 88% reduction of overall traffic volume across the existing N2 Slane Bridge: a signal-controlled, alternating one-way system. An HGV ban as part of the Proposed Scheme results in a 95% reduction in daily heavy vehicle volume over Slane Bridge. This greatly reduces braking, deceleration/ acceleration, tyre wear and idling of traffic on the approaches to the River Boyne. A significant decrease in potential pollutant sources is therefore predicted, i.e. less wear and tear on road surfaces, tyres and brake linings (copper and zinc sources); reduction in fuel combustion and hydrocarbon emissions (oil and PAH sources). The new Slane Bridge would allow free flow of traffic across the Boyne, with road surface drainage diverted through hybrid wetland attenuation ponds.

Because design year (2041) traffic levels for the proposed N2 Slane Bypass are low, the impact risk for aquatic receptors even in the absence of mitigation is expected to be low. At worst there may be slight disturbance of the macroinvertebrate community confined to a short distance immediately downstream of the road outfall on the Mattock (Mooretown) Stream, with a likely negligible impact on the much larger River Boyne. However, given the high sensitivity of the River Boyne (SAC / SPA), environmental control measures have been incorporated into the design of the road drainage system in order to attenuate suspended solids, trace metals and hydrocarbons from routine road drainage.

Attenuation basins will contain sections of constructed surface flow wetlands, planted with appropriate native aquatic vegetation. This is one of the better means of treating road drainage and provides biodiversity enhancement opportunities. Bruen et al. (2006) reported removal efficacy of a wetland treating run-off from Ireland's M7 at Monasterevin (25,000-30,000 AADT; 12.7% HGV) of up to 94% of the total suspended solids, 67% of total phosphate, 91% of total zinc, 67% of total cadmium, 60% of total lead and 78% of total copper. Attenuation basin/ hybrid wetlands will be used to treat the run-off from the roadway before it is directed to the River Boyne and the Mattock (Mooretown) Stream.

With regards to road run-off pollution in the operational phase, there is potential for a net-positive, long-term impact on water quality and aquatic ecology as a result of removal of 90% of vehicles (including a 95% reduction in HGVs) across the existing N2 Slane Bridge. It would be expected that the combination of: (1) predicted AADT on the proposed bypass route, and (2) attenuation and treatment of run-off via hybrid ponds/wetlands would lead to at worst an imperceptible-to neutral impact on receiving water quality, with potential for long-term positive impact compared to the Do-Nothing scenario

It is noted there is potential for long-term **positive** impact on aquatic ecology of (in particular) the River Boyne as a result of water quality improvement that may arise by introducing modern road drainage features, e.g. attenuation ponds. The Proposed Scheme removes significant sources of unattenuated (and consequently untreated) road run-off pollution from existing road surfaces that currently have inferior or no drainage treatment which would otherwise remain as sources of potential operational phase impact as traffic volumes increase into the future. This includes congested, stop-start traffic flows across the existing N2 Slane Bridge, which can give rise to elevated road surface run-off pollution in the form of heavy metal toxicity (Huber et al. 2016) and suspended solids, especially in relation to a high percentage of HGVs (current and predicted) on this route in the absence of a new bypass route.

Measures have been incorporated into Section 7.4 to ensure drainage features function effectively and are subject to regular inspection and maintenance.

The conclusion is that operational impacts (if any) of road surface drainage pollution on any migrating salmon '*adult spawning fish'* will be either be negligible and not discernible over baseline conditions and likely positive in the long-term, both locally and in the downstream zone of influence.

6.2.1.2.3.2 Salmon Fry and Out-migrating Smolt Abundance

Salmon has been screened in for assessment under the conservation attributes *'salmon fry abundance'* and *'out-migrating smolt abundance'*. During the operation of the Proposed Scheme, potential impacts are associated with road surface run-off pollutants, including sediment. It is predicted during the operational phase that the project may occasionally produce temporary and short-lived increases in suspended sediment concentrations in association with a high-intensity rainstorm for example, but, considering (a) the level of attenuation and treatment provided by the drainage design, and (b) the low average daily traffic volumes

predicted, the level of operational phase pollutant run-off will be negligible and not discernible over baseline conditions. If attenuation ponds were not well maintained in the long-term, there is potential for the operation of the Proposed Scheme to cause a decline in river water quality, therefore **precautionary measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

6.2.1.2.3.3 Number and Distribution of Redds

Salmon has been screened in for assessment under the conservation attribute *'number and distribution of redds'*. During the operation of the Proposed Scheme, potential impacts are associated with the release of pollutants such as sediment and pollutants potentially affecting gravels where salmon build their redds. The spread of IAPS may also contribute to increased sedimentation causing reduced bank stability (i.e. sedimentation).

There are limited, if any, spawning grounds (i.e. potential redds) within the ZoI on the main channel of the River Boyne. During the operation of the Proposed Scheme, potential impacts are associated with the release of road surface run-off pollutants, including sediment, but only in the lower reach of the Mattock River, upstream of the SAC boundary (i.e. salmon redds are not present in the lower main channel of the Boyne). It is predicted during the operational phase that the project will produce temporary and short-lived increases in suspended sediment concentrations in association with a high-intensity rainstorm for example, but, considering (a) the level of attenuation and treatment provided by the drainage design, and (b) the low average daily traffic volumes predicted, the effects of operational phase pollutant run-off will be either negligible and not discernible over baseline conditions or even positive in the long-term. If attenuation ponds were not well maintained in the long-term, there is potential for the operation of the Proposed Scheme to cause a decline in river water quality, therefore **measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

6.2.1.2.3.4 Water Quality

Salmon has been screened in for assessment under the conservation attribute *'water quality'*. During the operation of the Proposed Scheme, potential impacts are associated with the release of pollutants such as sediment and pollutants potentially impacting water quality. The target of this conservation objective is to ensure that watercourses sampled by the EPA remain at Q4 (minimum) for biological water quality. The Proposed Scheme supports connectivity to several drainage ditches, the River Mattock and the River Boyne and its tributaries. At present, the status of those sampled by the EPA and that intersect with the Proposed Scheme are as follows; River Boyne (Q4), River Mattock (Q3) and Devlins_020 (Q4).

It is predicted during the operational phase that the project will produce temporary and short-lived increases in suspended sediment concentrations but, considering (a) the level of attenuation provided by the design, and (b) the low traffic volumes predicted, the effects of operational phase pollutant run-off will be either negligible and not discernible over baseline conditions or even positive in the long-term.

If attenuation ponds were not well maintained in the long-term, there is potential for the operation of the Proposed Scheme to cause a decline in river water quality, therefore **measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

6.2.1.2.4 Otter

6.2.1.2.4.1 Distribution

Otter has been screened in for assessment under the conservation attribute *'distribution'*. The target of this conservation objective is to ensure no significant decline in their distribution. During the operation of the Proposed Scheme, potential impacts are associated with run-off from drainage systems (i.e. pollutants, silt and heavy metals), attenuation ponds, indirect impacts via pollution of the groundwater which meet surface water bodies (i.e. via the River Mattock, drainage ditches and tributaries of the River Boyne), disturbance during maintenance activities, direct mortality from vehicle collisions and the spread of invasive alien plant species (i.e. contributing to sedimentation). A decline in water quality has the potential to indirectly effect food sources (i.e. fish) available to otter.

In relation to invasive alien plant species, the operational footprint of the Proposed Scheme is not located within any locations where invasive plant species listed on the Third Schedule of the European Communities

(Birds and Natural Habitats) Regulations, as amended occur. Although the Proposed Scheme is located adjacent to a number of locations of Japanese Knotweed and Himalayan Balsam (particularly in proximity to the existing Slane bridge), the spread of IAPS is not likely to occur owing the nature of operational activities. This is in the absence of mitigation measures.

No adverse impacts are predicted on otter distribution as a result of the bridge itself (i.e. connectivity). The presence of the bridge itself and any maintenance activities will not cause any significant impact on the distribution of otter. Given the current use of the environment surrounding the River Boyne, otter populations in the area are considered to already be habituated to a level of human presence and noise within the environment (i.e. anthropogenic factors). No significant effects on otter or adverse impacts on site integrity will occur. This is in the absence of mitigation measures.

Maintenance activities as part of the operational phase will not impact on water quality or cause any significant disturbance as activities largely include visual inspections from the mainline, from ground level below the bridge and by boat. Surface drainage maintenance will be the most frequent task and ensures drainage structures are functioning as intended.

In relation pollution and water quality and the indirect effect on food sources, impacts are predicted to be similar to those as described under **Sections 6.2.1.2.2** (river lamprey), **Section 6.2.1.2.3** (salmon) and **Section 6.4.1.2.1** (kingfisher). No mitigation is proposed, however **measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

The operation of the Proposed Scheme could result in injury or mortality of otters coming into contact with vehicles travelling along the Proposed Scheme, however this is considered to be a low risk by virtue of the design of the proposed bridge crossing. In the absence of further design mitigation, this may result in otter entering the mainline and environs of the Proposed Scheme and attempting to cross the proposed bypass, thus increasing the potential for direct vehicle collision and mortality during the operational phase. Road kill of otters may be important on a local scale but it is not considered to be a significant threat to the long-term persistence of the species regionally or at a national level, especially considering the widespread distribution of otter in Ireland (Reid *et al.*, 2013). While records of otter road kill in Ireland are sparse[36], there is considered to be some potential for collision risk during the operational phase and for direct mortality to impact on the local distribution of otter. On a precautionary basis, adverse effects to site integrity, resulting from direct mortality of otter on the distribution of QI otter, cannot be ruled out in the absence of mitigation measures. Therefore, **mitigation is required to prevent direct mortality** and consequently adverse impacts on QI otter during the operational phase.

6.2.1.2.4.2 Extent of Terrestrial Habitat

Otter has been screened in for assessment under the conservation attribute *'extent of terrestrial habitat'.* During the operational phase, there will be no loss of terrestrial habitat. This is also the case for the wider scheme. Information in relation to the habitat loss is discussed further under **Section 6.2.1.1.**

Furthermore, maintenance activities as part of the operational phase will not impact on available terrestrial habitat for otter as activities largely include visual inspections from the mainline, from ground level below the bridge and by boat. Surface drainage maintenance will be the most frequent task and ensures drainage structures are functioning as intended.

Therefore, no significant decline of suitable habitat for otter will occur, and no adverse impacts on site integrity are predicted. This is in the absence of mitigation measures.

6.2.1.2.4.3 Couching Sites and Holts

Otter has been screened in for assessment under the conservation attribute *'couching sites and holts'.* There were no confirmed couching or resting sites recorded during field surveys, albeit considerable evidence of otter activity along the River Boyne up and downstream of the proposed River Boyne crossing point. The operational phase will not cause any adverse impacts on site integrity.

[36] Biodiversity maps – Road Kill Survey. Available at: https://maps.biodiversityireland.ie/ Accessed March 2023.

In the interim, a pre-construction survey for otter (see **Section 7.4**) will be carried out within the ZoI of the Proposed Scheme in order to identify any new territories and the establishment of any new breeding or couching sites.

6.2.1.2.4.4 Fish Biomass Available

Otter has been screened in for assessment under the conservation attribute *'fish biomass available'.* Potential impacts have been identified as a result of surface water run-off (sediment and pollutants). Adverse effects would be indirect (downstream sedimentation/ pollution).

The scale of structures and drainage features involved means there is widespread potential for the release of sediment and pollutants during the operational phase. Potential road drainage pollution includes suspended solids, heavy metals and hydrocarbons. A decline in water quality has the potential to effect fish, of which otter feed upon (see **Section 6.2.1.1.4.4**).

Given the high sensitivity of the River Boyne, run-off will be directed via attenuation basins containing sections of constructed surface flow wetlands, planted with appropriate native aquatic vegetation. As such, these attenuation ponds/wetlands will be used to treat the run-off from the roadway before it is directed to the River Boyne (and the Mattock (Mooretown) stream). The Proposed Scheme design also provides for a treatment train incorporating grassed channels, vortex grit separators and petrol/oil interceptors.

Maintenance activities will largely include visual inspections from the mainline, from ground level below the bridge and by boat. Surface drainage maintenance will be the most frequent task and ensures drainage structures are functioning as intended. Aggregation of silt captured within drainage during cleaning may bring about increases in the siltation of surface water, but are not considered to result in potentially adverse effects.

During the operational phase, run-off will be directed via attenuation basins and other road drainage features, which will remove significant sources of unattenuated road run-off pollution as part of the design of the Proposed Scheme. **Measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

6.2.1.2.4.5 Barriers to Connectivity

Otter has been screened in for assessment under the conservation attribute *'barriers to connectivity'.* Impacts are predicted to be similar to those as detailed in **Section 6.2.1.1.4.5**. During the operational phase, the presence of the proposed bridge crossing will not result in a barrier to connectivity for otter (i.e. clear span bridge allows for no obstruction to otter movement), and artificial lighting will not illuminate the riverine and riparian habitats within this SAC as the proposed bridge crossing which the connects the upstream and downstream stretches of the River Boyne, will remain unlit. Furthermore, the pedestrian/cyclist link bridge to the existing Boyne Canal towpath will also remain unlit. No other lighting associated with the Proposed Scheme (i.e. N2 South Roundabout; N51 Roundabout; N2 North Roundabout; Slane Village) is considered to contribute to an adverse effect on otter.

Adverse effects to site integrity can be ruled out as a result of from the Proposed Scheme. Therefore, **mitigation is not required.**

6.3 Boyne Coast and Estuary SAC

6.3.1 Assessment Against Relevant Conservation Objectives

Site-specific Conservation Objectives for the Boyne Coast and Estuary SAC were reviewed (NPWS, 2018) (see **Section 5.2.1.2**). The prediction of adverse effects on site integrity for 'relevant' site-specific attributes and QIs scoped into the assessment during the construction and operation of the Proposed Scheme are outlined in **Table 6-2**.

Table 6-2: Prediction of Effects on Site Integrity (QIs) of the Boyne Coast and Estuary SAC during all phases of the Proposed Scheme

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat (NPWS, 2018)	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2012c; Version 1 07/09/2012)	Target
Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140]	Water pollution (i.e. sedimentation and contaminants).	Pollution to surface waters (limnic, terrestrial, marine & brackish) (H01); Bridge, viaduct (D01.05); Other human intrusions and disturbances (G05); Urbanised areas, human habitation (E01); Storage of materials (E05); Invasive non-native species (I01).	**Habitat area** Potential identified	The permanent habitat area is stable or increasing, subject to natural processes.
			Community distribution Potential identified	Conserve the following community types in a natural condition: Intertidal estuarine mud and fine sand with *Hediste diversicolor* and *Corophium volutator* community; and Subtidal fine sand dominated by polychaetes community (1130); and Fine sand dominated by bivalves community complex (1140).
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] *Salicornia* and other annuals colonizing mud and sand [1310]	Water pollution (i.e. sedimentation and contaminants); and the spread of IAPS.		**Habitat area** Potential identified	Area stable or increasing, subject to natural processes, including erosion and succession.
			Habitat distribution Potential identified	No decline or change in habitat distribution, subject to natural processes.
			Physical structure: sediment supply Potential identified	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions.
			Physical structure: creeks and pans Potential identified	Maintain creek and pan structure, subject to natural processes, including erosion and succession.
			Physical structure: flooding regime Potential identified	Maintain natural tidal regime.
			Vegetation structure: zonation Potential identified	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession.
			Vegetation structure: vegetation height Potential identified	Maintain structural variation within sward.
			Vegetation structure: vegetation cover Potential identified	Maintain more than 90% of area outside creeks vegetated.

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat (NPWS, 2018)	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2012c; Version 1 07/09/2012)	Target
			Vegetation composition: typical species and sub-communities Potential identified	Maintain the presence of species-poor communities with typical species listed in the Saltmarsh Monitoring Project.
			Vegetation structure: negative indicator species - *Spartina anglica* No potential for spread or expansion as common cordgrass has not been identified within the footprint of the Proposed Scheme.	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%.
Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Water pollution (i.e. sedimentation and contaminants).		**The status of Mediterranean salt meadows (*Juncetalia maritimi*) as a qualifying Annex I habitat for Boyne Coast and Estuary SAC is currently under review. The outcome of this review will determine whether a site-specific conservation objective is set for this habitat.** Potential identified	Although no site-specific conservation objective has been set for this habitat, a precautionary approach has been applied. On this basis, and owing to the similarity of this habitat type with Atlantic salt meadows[37], the site-specific conservation objectives set for Atlantic salt meadows have also been used here for Mediterranean salt meadows.

Note: Rows in colour have been brought forward for further consideration and assessment of Conservation Objective attributes.

[37] Mediterranean salt meadows are distinguished from Atlantic salt meadows by the presence of rushes such as sea rush (*Juncus maritimus*) and/or sharp rush (*Juncus acutus*), along with a range of species typically found in Atlantic salt meadows, including sea aster (*Aster tripolium*), sea purslane (*Atriplex portulacoides*), sea-milkwort (*Glaux maritima*), saltmarsh rush (*Juncus gerardii*), parsley water-dropwort (*Oenanthe lachenalii*), sea plantain (*Plantago maritima*) and common saltmarsh grass (*Puccinellia maritima*) (NPWS, 2019b).

6.3.1.1 Construction Phase

6.3.1.1.1 Estuaries; Mudflats and Sandflats

6.3.1.1.1.1 Habitat Area

Estuaries, and mudflats and sandflats have been screened in for assessment on a precautionary basis (as detailed earlier) and based on, at most, a low risk of a detectable adverse effect on the integrity of the SAC occurring. It has been assessed under the conservation attribute '*habitat area'* as a result of such effects occurring during the pre-construction archaeological/GI surveys and the construction phase itself. On a precautionary basis, potential impacts have been identified as a result of water run-off (sediment and pollutants). Adverse effects would be indirect (downstream sedimentation/ pollution). The Proposed Scheme will not cause any direct loss of habitat area as it does not intersect or require the removal of habitat associated with the Boyne Coast and Estuary SAC.

Habitat deterioration, modification and/or alteration as a result of water pollution may indirectly contribute to habitat loss in the long-term (i.e. there is potential for the rate of sedimentation deposition and associated pollutants to influence habitat area). Given the spatial separation of the Proposed Scheme from the SAC, the contribution of dilution effect over such a distance and mindful that, particularly with respect to silts, the input, mobilisation and deposition of silts is a natural process of estuarine habitats, it is not considered that any impacts arising in their own right as a result of the project would be significant to result in detectable habitat deterioration, modification or alteration. Rather, it is envisaged that any impacts would be contributory to any existing threats to the SAC.

The scale of earthworks, structures and drainage features involved means there is widespread potential for the release of sediment and pollutants during the construction phase; including in the vicinity of the River Boyne and River Blackwater SAC where temporary cofferdam and working platforms will be constructed in order to facilitate the piling of bridge piers and construction of the bridge. There is potential for these to be transported downstream over time and, if this did occur, there is likely to be a lag between the impact occurring and the effect occurring and becoming detectable at the SAC. It is considered that the risk of a contributory affect to the SAC is low even in the absence of mitigation. However, on a precautionary basis, in the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (pollutants and sedimentation)** and consequently impacts on the downstream habitat area of estuaries, and mudflats and sandflats during the construction phase.

6.3.1.1.1.2 Community distribution

Estuaries, and mudflats and sandflats have been screened in for assessment on a precautionary basis (as detailed earlier) and based on, at most, a low risk of a detectable adverse effect on the integrity of the SAC occurring. It has been assessed under the conservation attribute '*community distribution'* as a result of such effects occurring during the pre-construction archaeological/GI surveys and the construction phase itself. On a precautionary basis, potential impacts have been identified as a result of water run-off (sediment and pollutants). Adverse effects would be indirect (downstream sedimentation/ pollution). The Proposed Scheme will not cause any direct loss of community distributions and types as it does not intersect or require the removal of habitat associated with the Boyne Coast and Estuary SAC.

As mentioned in **Section 6.3.1.1.1**, sediment deposition on the estuary bed and suspended solids within the water column can greatly affect distribution and abundance within this habitat type (NPWS, 2019b). Pollutants are also known to have one of the greatest impacts on the health of estuarine community distribution. Pollutants can reduce water clarity, smother benthic habitat, cause toxicity to organisms, cause excessive algal growth, reduced dissolved oxygen and cause changes in water temperature. It is the target of this attribute to conserve the following community types: *Hediste diversicolor*, *Corophium volutator*, polychaetes and bivalves. As these species are all sediment dwelling organisms, and environmental contaminants released into water tend to accumulate in sediment- they are potentially subject to exposure of adverse effects (i.e. habitat quality).

Given the spatial separation of the Proposed Scheme from the SAC, the contribution of dilution effect over such a distance and mindful that, particularly with respect to silts, the input, mobilisation and deposition of silts is a natural process of estuarine habitats, it is not considered that any impacts arising in their own right as a result of the project would be so significant to result in noticeable habitat deterioration, modification or

alteration to effect community distribution. Rather, it is envisaged that any impacts would be contributory to any existing threats to the SAC.

There is potential for the proposed works to release sediments and pollutants and for these to be transported downstream over time and, if this did occur, there is likely to be a lag between the impact occurring and the effect occurring and becoming detectable at the SAC. It is considered that the risk of a contributory affect to the SAC is low even in the absence of mitigation.

However, on a precautionary basis, in the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (pollutants and sedimentation)** and consequently the downstream habitat area of estuaries, and mudflats and sandflats during the construction phase.

6.3.1.1.2 Atlantic salt meadows; Salicornia and other annuals; Mediterranean salt meadows

6.3.1.1.2.1 Habitat Area and Distribution

Atlantic salt meadows, *Salicornia* and other annuals and Mediterranean salt meadows have been screened in for assessment on a precautionary basis (as detailed earlier) and based on, at most, a low risk of a detectable adverse effect on the integrity of the SAC occurring. It has been assessed under the conservation attributes '*habitat area'* and '*habitat distribution'* as a result of such effects occurring during the pre-construction archaeological/GI surveys and the construction phase itself. On a precautionary basis, potential impacts have been identified as a result of water run-off (sediment and pollutants). Adverse effects would be indirect (downstream sedimentation/ pollution).

The Proposed Scheme will not have a direct effect on habitat area or distribution as it does not intersect or require the removal of habitat associated with the Boyne Coast and Estuary SAC. However, habitat deterioration, modification and/or alteration as a result of water pollution may indirectly contribute to habitat loss in the long-term (i.e. habitat quality).

Impacts predicted are the same as those described under **Section 6.3.1.1.1.1** and **Section 6.3.1.1.1.2** such that sediment and water pollution have the potential to cause habitat and community degeneration, therefore potentially causing an adverse effect on habitat area and distribution. However, it is considered that the risk of a contributory affect to the SAC is low even in the absence of mitigation.

On a precautionary basis, in the absence of mitigation, **adverse effects to site integrity** cannot be ruled out as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (pollutants and sedimentation)** and consequently the downstream habitat area and habitat distribution of Atlantic salt meadows, Salicornia and other annuals and Mediterranean salt meadows during the construction phase.

6.3.1.1.2.2 Physical Structure

Atlantic salt meadows, *Salicornia* and other annuals and Mediterranean salt meadows have been screened in for assessment on a precautionary basis (as detailed earlier) and based on, at most, a low risk of a detectable adverse effect on the integrity of the SAC occurring. It has been assessed under the conservation attributes *'sediment supply', 'creeks and pans', and 'flooding regime'* as a result of such effects occurring during the pre-construction archaeological/GI surveys and the construction phase itself. On a precautionary basis, potential impacts have been identified as a result of water run-off (sediment). Adverse effects would be indirect (downstream sedimentation).

The physical structure of these habitat types are specifically related to sediment supply, creeks and pans and the flooding or tidal regime. There is potential that the Proposed Scheme through the release of sediment may alter the natural circulation of sediment and the structure of creeks and pans through increased sediment deposition. Sedimentation deposition may accelerate sedimentation rates, thereby altering natural processes. However, as detailed in the aforementioned sections, it is considered that the risk of a contributory affect to the SAC is low even in the absence of mitigation. Albeit this conclusion, the precautionary principle has been applied.

The presence of attenuation ponds/wetlands will greatly reduce the risk of untreated or uncontrolled discharges entering the watercourses during the construction phase, however mitigation in the form of vortex grit chambers and silt barriers will be required. Therefore, in the absence of sediment transport modelling and appropriate mitigation measures, adverse effects as a result of sedimentation cannot be ruled out.

In terms of flooding and tidal regime, no in-stream work (other than the construction of outfalls) are proposed within the River Boyne, however both the temporary construction platform (coffer dams) and permanent bridge infrastructure have been considered owing to their location within the flood plain of the River Boyne. Culvert installation is also required to accommodate the works along the mainline.

A detailed flood risk assessment has been completed for the Proposed Scheme (refer to **EIAR Volume 4**, **Appendix 17.2**). The assessment concluded that the impact of both the temporary and permanent works for the Boyne bridge crossing and the Mattock (Mooretown) Stream will not have an adverse effect on flood risk elsewhere. Therefore, no adverse impacts on flooding regime are predicted.

On a precautionary basis, in the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (sediment)** and consequently the downstream habitat physical structure of Atlantic salt meadows, *Salicornia* and other annuals and Mediterranean salt meadows during the construction phase.

6.3.1.1.2.3 Vegetation Structure and Composition

Atlantic salt meadows, Salicornia and other annuals and Mediterranean salt meadows have been screened in for assessment on a precautionary basis (as detailed earlier) and based on, at most, a low risk of a detectable adverse effect on the integrity of the SAC occurring. It has been assessed under the conservation attributes '*zonation', ' vegetation height and cover'* and *'typical species and sub-communities'* as a result of such effects occurring during the pre-construction archaeological/GI surveys and the construction phase itself. On a precautionary basis, potential impacts have been identified as a result of water run-off (contaminants and sediment). Adverse effects would be indirect (downstream sedimentation/ pollution).

The Proposed Scheme will not cause any direct loss of vegetation as it does not intersect or require the removal of habitat associated with the Boyne Coast and Estuary SAC. There is potential that the Proposed Scheme may negatively affect vegetation structure and composition as a result of sediment build up between swards causing sediment retention and settlement on plant surfaces. Contaminants may also negatively affect plants, reducing their survival and their quality of habitat. Sedimentation and pollution can therefore impact on vegetation structure, height, zonation and the composition of sub-communities (i.e. *Salicornia, Puccinellia maritima, Aster tripolium, Suaeda maritima*). If this did occur, there is likely to be a lag between the impact occurring and the effect occurring at the SAC. It is considered that the risk of a contributory affect to the SAC is low even in the absence of mitigation.

Notwithstanding this, on a precautionary basis, in the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (sediment and pollutants)** and consequently the downstream vegetation structure and composition of Atlantic salt meadows, *Salicornia* and other annuals and Mediterranean salt meadows during the construction phase.

6.3.1.2 Operational Phase

As described in **Section 6.3.1.1**, potential impacts have been identified as a result of surface water run-off (sediment and pollutants) on the conservation objective targets, namely, habitat area, community distribution, physical structure, vegetation structure, and vegetation composition. However, the potential for adverse effects are considered differently during the operational phase for these downstream habitats.

During the operational phase, in the absence of mitigation measures it is predicted that there will be no significant changes in water quality which would be significant or contributory to the SAC; particularly due to the operational design of the project, the spatial separation of the Proposed Scheme from the SAC and the dilutionary effect of both the freshwater and estuarine environment.

During the operational phase, a number of standard surface water control measures will also be incorporated into the design, these include; Grassed Surface Water Channels, Filter Drains and Attenuation/Retention ponds. These requirements (SuDS) aim to give effect to the protections under the Water Framework Directive 2000/60/EC generally. Although these measures will indeed contribute to the water quality of receiving waterbodies, they are not considered here with the intention of avoiding or reducing a harmful effect on a European site.

Based on this, sediment, pollutants and the spread of IAPS (even in the absence of any SuDS measures) associated with the operational phase of the Proposed Scheme will not jeopardise the conservation targets for habitat area; community distribution; physical structure; vegetation structure; and vegetation composition

of intertidal habitats. Therefore, no adverse effects on site integrity are predicted to occur, and **measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

For the conservation target for hydrological regime, no surface water generated from the Proposed Scheme entering the River Boyne, or other tributaries and drainage ditches that flow into the River Boyne will be of sufficient volume to affect the flooding depth/height of the water table. The proposed bridge will introduce a negligible hydraulic constraint into the River Boyne channel as it achieves significant clearance of approximately 12 m to the river with no footprint located within the main channel while also maintaining the additional 10 m setback to the river channel on both banks. The bridge will require the northern end of the Boyne Valley to be filled in over a distance of approximately 15 m, the increase in flooding risk due to this fill is negligible.

Based on this, hydrological changes associate with the operational phase of the Proposed Scheme shall not jeopardise the conservation targets for hydrological regime. Therefore, no adverse effects on site integrity are predicted to occur.

6.4 River Boyne and River Blackwater SPA

6.4.1 Assessment Against relevant Conservation Objectives

The published Conservation Objective for the River Boyne and River Blackwater SPA is to "…maintain or restore the favourable conservation condition of…" kingfisher, which is the only listed Special Conservation Interest for the SPA. There are no published attributes or targets for the SPA; however, the published Site Specific Conservation Objective states that the favourable conservation status of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats; and
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

In order to assess whether the Proposed Scheme will result in an adverse effect on integrity of the SPA, and in the absence of published attributes or targets for the SPA, the assessment will need to consider whether the Proposed Development will prevent the maintenance or restoration of the favourable conservation condition of Kingfisher within the River Boyne and River Blackwater SPA. The prediction of adverse effects on the maintenance or restoration of the favourable conservation condition of kingfisher are outlined in **Table 6-3**.

Table 6-3: Prediction of Effects on Site Integrity (QIs) of the River Boyne and River Blackwater SPA during all Phases of the Proposed Scheme

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat (NPWS, 2020b)	Potential for adverse effect(s) on the maintenance or restoration of the favourable conservation condition
Kingfisher *Alcedo atthis* [A229]	Surface and ground water pollution (i.e. sedimentation and contaminants); disturbance (i.e. noise, vibration, human presence and lighting); and habitat destruction, fragmentation, and deterioration and alteration.	Roads, motorways (D01.02); and Urbanised areas, human habitation (E01).	**Population dynamics** Potential identified
			Natural range Potential identified
			Sufficiently large habitat Potential identified

Note: Rows in colour have been brought forward for further consideration and assessment of the Conservation Objective.

6.4.1.1 Construction Phase

6.4.1.1.1 Population Dynamics; Natural Range

Kingfisher has been screened in for assessment under '*population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats'* and '*natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future'* in order to assess whether the Proposed Scheme will result in an adverse effect on site integrity of the SPA and whether the Proposed Scheme will prevent the maintenance or restoration of the favourable conservation condition of kingfisher.

Potential impacts have been identified as a result of disturbance (noise, vibration, lighting and human presence), impacts on available commuting and foraging habitat (i.e. habitat destruction, fragmentation, and deterioration/ alteration) and barrier effects (i.e. the proposed bridge crossing). Adverse effects would be direct.

Localised disturbance to commuting and foraging kingfisher populations could occur as a result of noise/vibration emissions (i.e. construction sites, excavations, piling, human presence) and artificial lighting during (i.e. construction sites, machinery and intermittent night time working) construction. Disturbance may temporarily impact local kingfisher population dynamics by causing changes in their behaviour/movements within the immediate River Boyne corridor. Changes in the behaviour/movements of kingfisher resulting from disturbance could subsequently impact upon the natural range of this SCI, at a local level. No overall impact on the natural range of the SCI at the scale of the SAC is anticipated given the linear extent of the SAC. However, mindful that few sightings of the bird were made during site-specific surveys at the River Boyne (see **Section 4.4**), and only the temporary disturbance anticipated as a result of the Proposed Scheme, noise, vibration, lighting and human presence are not considered to adverse effect on the site integrity of this SPA, nor the natural range of population dynamic of kingfisher. No mitigation is required.

Available commuting habitat for local kingfisher populations may become temporarily and locally reduced (working areas within floodplain) due to the construction activities taking place adjacent and over the River Boyne, however neither are expected to cause an adverse effect on kingfisher commuting in the area. No overhanging vegetation suitable for perching was identified within the footprint of the Proposed Scheme and the surrounding area supports abundant commuting and perching habitat (see **Section 4.4**) with the limitation locally appearing to be the availability of suitable banks for nest formation. As such, the Proposed Scheme will not result in an adverse effect on the site integrity of this SPA, nor the natural range or population dynamic of kingfisher. No mitigation is required.

Available foraging habitat (i.e. aquatic insects and fish) will not be directly affected by the Proposed Scheme as there will be no habitat loss within the River Boyne. The proposed bridge crossing adopts a adopts a four-span bridge design with a deck which is 12m above median river level. There are no construction works within 10m of the river and no in river works. However, habitat deterioration may occur as a result of surface water run-off and air pollution. Surface water run-off and the release of pollutants or suspended solids into the watercourse, may also indirectly affecting fish and aquatic invertebrates of which kingfisher depend on and therefore population dynamics and natural range.

As detailed above, the proposed bridge crossing could potentially cause a physical obstruction to the movement of SCI kingfisher within the River Boyne corridor. However, there is no requirement for instream works (i.e. the Proposed Scheme adopts a four-span weathering steel plate girder bridge) with more than adequate freeboard (i.e. the bridge is 12 m above median river levels). As such, the Proposed Scheme will not result in an adverse effect on the site integrity of this SPA, nor the natural range or population dynamic of kingfisher. No mitigation is required.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled** out as a result of the Proposed Scheme. **Mitigation is required** in order to prevent impacts on water quality (pollution and sedimentation) in order to maintain the population dynamic and natural range of kingfisher populations of the SPA.

Additionally, applying the precautionary principle, **pre-construction surveys will be completed** to identify any further evidence of breeding, commuting and/or foraging should territories become established since the time of writing this report.

6.4.1.1.2 Sufficiently Large Habitat

Kingfisher has been screened in for assessment under '*sufficiently large habitat to maintain its populations on a long-term basis*' in order to assess whether the Proposed Scheme will result in an adverse effect on site integrity of the SPA and whether the Proposed Scheme will prevent the maintenance or restoration of the favourable conservation condition of kingfisher.

Potential impacts have been identified as a result of impacts on available breeding, commuting and foraging habitat (i.e. habitat destruction, fragmentation, and deterioration/ alteration) during the construction phase. Adverse effects would be direct.

As detailed under **Section 4.6.2**, the number of records of kingfisher in Ireland are generally low, which was further supported by few sightings of the bird during site-specific surveys at the River Boyne (see **Section 4.4**). Habitats along the banks of the River Boyne were deemed unsuitable for breeding kingfisher during field surveys (i.e. no optimal vertical soft-substrate nesting habitat), however, a breeding location and territory were identified approximately 400m and 525m from the Proposed Scheme. Given the distance between the Proposed Scheme and these records (no overlap), and the lack of nesting habitat within the footprint of the scheme, direct adverse effects on breeding habitat available to kingfisher, will not occur. As such, the Proposed Scheme will not result in an adverse effect on the site integrity of this SPA, or the breeding habitat available to maintain the population of kingfisher on a long-term basis. No mitigation is required.

Available commuting habitat for local kingfisher populations may become temporarily reduced (working areas within floodplain) due to the construction activities taking place adjacent and over the River Boyne, however neither are expected to cause an adverse effect on kingfisher commuting in the area. No overhanging vegetation suitable for perching was identified within the footprint of the Proposed Scheme and the surrounding area supports abundant commuting and perching habitat (see **Section 4.4**). As such, the Proposed Scheme will not result in an adverse effect on the site integrity of this SPA, or the commuting habitat available to maintain the population of kingfisher on a long-term basis. No mitigation is required.

Available foraging habitat (i.e. aquatic insects and fish) will not be directly affected by the Proposed Scheme as there will be no habitat loss within the River Boyne. The proposed bridge crossing adopts a adopts a four-span bridge design with a deck which is 12m above median river level. There are no construction works within 10m of the river and no in river works. However, habitat deterioration may occur as a result of surface water run-off and air pollution. Surface water run-off and the release of pollutants or suspended solids into the watercourse, may also indirectly affecting fish and aquatic invertebrates of which kingfisher depend. Therefore, in the absence of mitigation, **adverse effects to site integrity cannot be ruled** out as a result of the Proposed Scheme. **Mitigation is required** in order to prevent impacts on water quality (pollution and sedimentation) in order to maintain the foraging habitat available for kingfisher populations of the SPA on a long term basis.

Additionally, applying the precautionary principle, **pre-construction surveys will be completed** to identify any further evidence of breeding kingfisher should territories become established since the time of writing this report.

6.4.1.2 Operational Phase

6.4.1.2.1 Population Dynamics; Natural Range

Kingfisher has been screened in for assessment under '*population dynamics data on the species concerned indicate that it is maintaining itself on a long-term basis as a viable component of its natural habitats'* and '*natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future'* in order to assess whether the Proposed Scheme will result in an adverse effect on site integrity of the SPA and whether the Proposed Scheme will prevent the maintenance or restoration of the favourable conservation condition of kingfisher.

Potential impacts have been identified as a result of disturbance (noise, vibration, artificial lighting and human presence), specifically the proposed bridge crossing and cycleway/pedestrian link bridge. Adverse effects would be direct.

As described in **Section 6.4.1.1.1**, disturbance can temporarily impact local population dynamics by causing changes in the behaviour/movements of kingfisher within the immediate River Boyne corridor. Changes in the behaviour/movements of kingfisher resulting from disturbance could subsequently impact upon the

natural range of this SCI, on a local scale. During the operational phase, disturbance is associated with traffic and pedestrian movements, and bridge lighting requirements.

However, given the presence and location of the current bridge at Slane, high traffic volumes and walking trails along the River Boyne which have a high public presence, it is not anticipated that disturbance in the form of noise and increased human activity will have a negative effect on this SCI species. Given this current use of the environment surrounding the River Boyne, commuting and foraging kingfisher populations in the area are considered to already be habituated to the presence of such anthropogenic factors. As such, the Proposed Scheme will not result in an adverse effect on the site integrity of this SPA, nor the natural range of population dynamic of kingfisher as a result of disturbance. No mitigation is required.

Artificial lighting during the operational phase is associated with artificial illumination of the Proposed Scheme. However, light spill along the River Boyne corridor and any subsequent effects on the population and natural range of kingfisher shall not occur, owing to the fact that the proposed bridge crossing is to remain unlit during the operational phase. As there is no pathway of effect for the Proposed Scheme to illuminate the riverine and riparian habitats within this SPA, the Proposed Scheme will not result in an adverse effect on the site integrity of this SPA, nor the natural range of population dynamic of kingfisher as a result of disturbance. No mitigation is required.

6.4.1.2.2 Sufficiently Large Habitat

Kingfisher has been screened in for assessment under '*sufficiently large habitat to maintain its populations on a long-term basis*' in order to assess whether the Proposed Scheme will result in an adverse effect on site integrity of the SPA and whether the Proposed Scheme will prevent the maintenance or restoration of the favourable conservation condition of kingfisher.

Potential impacts have been identified as a result of impacts on available foraging habitat (i.e. surface water run-off (sediment and pollutants)). Adverse effects would be indirect (downstream sedimentation/ pollution).

The scale of structures and drainage features means there is widespread potential for the release of sediment and pollutants during the operational phase. Potential road drainage pollution includes suspended solids, heavy metals and hydrocarbons. Surface water run-off and the release of sediment and pollutants into the watercourse can cause a decline in water quality and impact upon fish and aquatic invertebrates, of which kingfisher feed upon (see **section 6.4.1.1.1**).

Given the high sensitivity of the River Boyne, run-off will be directed via attenuation basins containing sections of constructed surface flow wetlands, planted with appropriate native aquatic vegetation. As such, these attenuation ponds/wetlands will be used to treat the run-off from the roadway before it is directed to the River Boyne (and the Mattock (Mooretown) stream). The Proposed Scheme design also provides for a treatment train incorporating grassed channels, vortex grit separators and petrol/oil interceptors.

Maintenance activities will largely include visual inspections from the mainline, from ground level below the bridge and by boat. Surface drainage maintenance will be the most frequent task and ensures drainage structures are functioning as intended. Aggregation of silt captured within drainage during cleaning may bring about increases in the siltation of surface water, and potentially adverse effects on kingfisher foraging habitat.

It is recognised that during the operational phase, run-off will be directed via attenuation basins and other road drainage features, which will remove significant sources of unattenuated road run-off pollution as part of the design of the Proposed Scheme. However, **precautionary mitigation measures have been incorporated into Section 7.4** to ensure drainage features function effectively, are subject to regular inspection and maintenance and will ensure the maintenance of the foraging habitat available for kingfisher populations of the SPA on a long term basis.

6.5 Boyne Estuary SPA

6.5.1 Assessment Against Relevant Conservation Objectives

Site-specific conservation objectives for the River Boyne and River Blackwater SPA were reviewed (NPWS, 2013b) (see **Section 5.2.1.3**). The prediction of adverse effects on site integrity for 'relevant' site-specific attributes and QIs scoped into the assessment during the construction and operation of the Proposed Scheme are outlined in **Table 6-4**.

Table 6-4: Prediction of Effects on Site Integrity (QIs) of the Boyne Estuary SPA during all phases of the Proposed Scheme

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat (NPWS, 2020a)	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2013b; Version 1 26/02/2013)	Target
Shelduck *Tadorna tadorna*	Water pollution (i.e. sedimentation and contaminants); and disturbance (i.e. noise, vibration, human presence and lighting).	Urbanised areas, human habitation (E01); Invasive non-native species (I01); and Siltation rate changes, dumping, depositing of dredged deposits (J02.11).	**Population trend** Potential identified	Long term population trend stable or increasing.
Oystercatcher *Haematopus ostralegus*				
Golden Plover *Pluvialis apricaria*				
Grey Plover *Pluvialis squatarola*				
Lapwing *Vanellus vanellus*				
Knot *Calidris canutus*			**Distribution** Potential identified	No significant decrease in the range, timing or intensity of use of areas, other than that occurring from natural patterns of variation.
Sanderling *Calidris alba*				
Black-tailed Godwit *Limosa limosa*				
Redshank *Tringa tetanus*				
Turnstone *Arenaria interpres*				
Little Tern *Sterna albifrons*			**Breeding population abundance: apparently occupied nests (AONs)** None predicted. There are no known breeding colonies within the area of the Proposed Scheme (see Table 4.2). Furthermore, there is not considered to be any significant potential for the Proposed Scheme to influence the breeding population of little tern.	No significant decline.
			Productivity rate: fledged young per breeding pair	No significant decline.

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat (NPWS, 2020a)	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2013b; Version 1 26/02/2013)	Target
			As per 'breeding population abundance'.	
			Distribution: breeding colonies As per 'breeding population abundance'.	No significant decline.
			Disturbance at the breeding site As per 'breeding population abundance'.	Human activities should occur at levels that do not adversely affect the breeding little tern population.
			Prey biomass available Potential identified	No significant decline.
			Barriers to connectivity Potential identified	No significant increase.
Wetlands	Water pollution (i.e. sedimentation and contaminants); spread of IAPS; the construction and operation of the proposed bridge.		**Habitat area** Potential identified	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 594 ha, other than that occurring from natural patterns of variation.

Note: Rows in colour have been brought forward for further consideration and assessment of Conservation Objective attributes.

6.5.1.1 Construction Phase

6.5.1.1.1 Population Trend

A number of SCI birds have been screened in for assessment under the conservation attribute '*population trend'* during the construction phase.

Firstly, potential impacts have been identified as a result of disturbance within the footprint and/or immediate environs of the Proposed Scheme in relation to golden plover and northern lapwing. Both species were noted during field surveys (see **Section 4.6**).

Based on the information available, it can't be confirmed whether the populations of these two species within and adjacent to the Proposed Scheme are part of the populations from the SPA. However, as a precautionary measure it has been assumed that they could potentially be ex-situ populations of the SPA since such species are known to use both coastal/estuarine and inland areas as part of their life-cycle.

Adverse effects would be direct (displacement). These SCI species are not considered here for impacts related to water pollution (i.e. indirect effects on food supply such as fish), as both species have a diet which consists of insects, worms, spiders, and other small invertebrates from the *terrestrial* environment (**Section 6.5.1.1.1.1**). However, it is noted that both golden plover and northern lapwing may use intertidal/estuarine habitat (i.e. mudflats) for roosting downstream of the Proposed Scheme (**Section 6.5.1.1.1.2**).

Secondly, potential impacts have been identified as a result of water pollution (sedimentation and pollutants) on downstream supporting inter-tidal habitat, used by the following birds: golden plover, lapwing, redshank, shelduck, oystercatcher, grey plover, knot, sanderling, black-tailed godwit, turnstone, and little tern (**Section 6.5.1.1.1.1**). Given the spatial separation of the Proposed Scheme from the SPA and the contribution of dilution, it is not considered that any impacts arising in their own right as a result of the Proposed Scheme would be so significant to result in noticeable habitat deterioration, modification or alteration as a result of water pollution. Rather, it is envisaged that any impacts would be contributory to any existing threats to the SPA.

There is potential for sediment and pollutants to be transported downstream over time and, if this did occur, there is likely to be a lag between the impact occurring and the effect occurring at the SPA. It is considered that the risk of a contributory affect to the SPA is low even in the absence of mitigation. However, this impact and potential effects have been assessed on a precautionary basis. Adverse effects would be indirect (downstream sedimentation/ pollution). Aside from golden plover and lapwing, none of the remaining SCI birds were noted during field surveys (see **Section 4.6**).

The current conservation condition of these SCI birds are detailed in **Section 5.2.1.4**, with turnstone, lapwing and redshank all being of unfavourable conservation condition while turnstone, knot and grey plover have all experienced the greatest population change, showing an all-Ireland decline of -31.2%, -48.% and -42.4% over the past 5 years.

6.5.1.1.1.1 Impacts within the Footprint and/or Immediate Environs of the Proposed Scheme

The Proposed Scheme has the potential to cause disturbance to commuting and foraging golden plover and northern lapwing which are likely to occur within the footprint and/or immediate environs of the Proposed Scheme, owing to the presence of suitable habitat. Suitable habitats include agricultural grassland and arable land. Disturbance includes the physical presence of the bridge itself (see also **Section 6.5.1.1.2**), newly proposed mainline, noise/vibration emissions, human presence and artificial lighting which may result in the displacement of golden plover and northern lapwing. The ZoI for disturbance on commuting and foraging birds (golden plover and northern lapwing) is considered to be within the footprint and 2 km of the Proposed Scheme.

In terms of potential impacts as a result of noise/vibration emissions and presence of the bridge - agricultural grassland and arable land are both considered widely distributed and available within the environs at Slane and as detailed in **Table 4-2**, both species are considered reliant on their supporting habitat but also highly likely to utilise alternative habitats at certain times (NPWS, 2012b). Therefore, it is highly likely that displaced golden plover and northern lapwing will be able to relocate to proximal habitat that offers similar feeding opportunities, such as prey abundance. During wintering bird surveys, lapwing and golden plover were primarily recorded flying over the Proposed Scheme area rather than using habitat within the footprint or

immediate environs of the scheme (see **Table 4-6**). Furthermore, as described in **Section 6.7**, no in-combination effects have been identified that may interact with proximal suitable SCI habitat.

In relation to artificial lighting, construction works, in general, will be undertaken during normal daylight working hours. However, some night time work is expected (albeit intermittent) to facilitate safe working conditions. The effect of artificial illumination on golden plover and northern lapwing are relatively unknown but there is potential for light spill to deter or alter behaviour/movements of SCI birds within the immediate River Boyne corridor and the wider scheme, particularly where areas were previously undisturbed (Boyne crossing). BCT (2014) have suggested that artificial lighting can be associated with several aspects of changes to bird behaviour and could disrupt the long-term circadian rhythm that dictates the onset of the breeding season. In the absence of appropriate mitigation, there is potential for adverse impacts on site integrity.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to ensure artificial lighting** will not cause an impact on the population trend of SCI birds (golden plover and northern lapwing) during the construction phase.

6.5.1.1.1.2 Impacts Associated with Downstream Supporting Habitat

The Proposed Scheme has, at most, a low risk potential to cause water pollution which may indirectly effect food resources (i.e. small fish, crustaceans and macroinvertebrates) available to SCI birds (redshank, shelduck, oystercatcher, grey plover, knot, sanderling black-tailed godwit, turnstone and little tern) using habitat within the Boyne Estuary. Water quality impacts have the potential to arise as a result of contaminated surface water and/or an accidental pollution event.

Impacts on food availability can have a negative effect on the survival and abundance of SCI bird populations. Furthermore, water pollution may also contribute to changes in the sediment regime of inter-tidal habitats, therefore causing habitat deterioration which is linked with population trends.

During the construction phase, attenuation basins/wetlands are to be fully operational for the attenuation / settlement of site run-off. This will greatly reduce the risk of untreated or uncontrolled discharges entering the watercourses during the construction phase and is seen as a critical step in avoiding and preventing potentially significant impacts on the River Boyne. Furthermore, as described under **Section 6.5.1.1,** it is not considered that any impacts arising in their own right as a result of the Proposed Scheme would be so significant to result in noticeable habitat deterioration, modification or alteration as a result of water pollution. Rather, it is envisaged that any impacts would be contributory to any existing threats to the SPA. It is considered that the risk of a contributory affect to the SPA is low even in the absence of mitigation. However, the precautionary principle has been applied.

Therefore, in the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. **Mitigation is required in order to prevent impacts on water quality (sedimentation and pollution)** and consequently population trends of SCI birds (redshank, shelduck, oystercatcher, grey plover, knot, sanderling black-tailed godwit, turnstone and little term) during the construction phase.

6.5.1.1.2 Distribution

A number of SCI birds have been screened in for assessment under the conservation attribute '*distribution*' during the construction phase. Impacts are predicted to be the same as those detailed under population trend, see **Section 6.5.1.1.1**.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to ensure artificial lighting** will not cause an impact on the population trend of SCI birds (golden plover and northern lapwing) during the construction phase.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent contributory impacts on water quality (sedimentation and pollution)** and consequently population trends of SCI birds (redshank, shelduck, oystercatcher, grey plover, knot, sanderling black-tailed godwit, turnstone and little tern) during the construction phase.

6.5.1.1.1 Prey Biomass Available

A number of SCI birds have been screened in for assessment under the conservation attribute '*prey biomass available*' during the construction phase. Potential impacts have been identified as a result of surface water run-off (sediment and pollutants). Adverse effects would be indirect (downstream sedimentation/ pollution).

As detailed under Section **6.5.1.1.1**, golden plover and northern lapwing both have a diet which consists of insects, worms, spiders, and other small invertebrates from the terrestrial environment. Therefore, they are not considered in this assessment. However, redshank, shelduck, oystercatcher, grey plover, knot, sanderling black-tailed godwit, turnstone and little tern are considered, as they depend upon freshwater/intertidal food resources such as small fish, crustaceans and macroinvertebrates, which may be affected as a result of water pollution downstream of the Proposed Scheme.

The presence of attenuation ponds/wetlands will greatly reduce the risk of untreated or uncontrolled discharges entering the watercourses during the construction phase, however mitigation in the form of oil interceptors and vortex grit chambers will be required. Furthermore, as described under Section 6.5.1.1, it is not considered that any impacts arising in their own right as a result of the Proposed Scheme would be so significant to result in noticeable habitat deterioration, modification or alteration as a result of water pollution. Rather, it is envisaged that any impacts would be contributory to any existing threats to the SPA. It is considered that the risk of a contributory affect to the SPA is low even in the absence of mitigation. In the absence of sediment transport modelling and mitigation measures to control water pollution, the precautionary principle has been applied and adverse impacts on site integrity cannot be ruled out.

Therefore, in the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. **Mitigation is required in order to prevent impacts on water quality (pollution and sedimentation)** and consequently prey biomass availability of SCI birds (redshank, shelduck, oystercatcher, grey plover, knot, sanderling black-tailed godwit, turnstone and little tern) during the construction phase.

6.5.1.1.2 Barriers to Connectivity

Golden plover and northern lapwing have been screened in for assessment under the conservation attribute '*barriers to connectivity*' during the construction phase. Potential impacts have been identified as a result of displacement (specifically the proposed bridge crossing and associated works), which are known to be commuting and foraging in the area. Barriers to connectivity come in the form of the physical presence of the bridge itself, noise/vibration emissions (which includes human presence) and artificial lighting. Adverse effects would be direct. No adverse effects as a result of the erection of the proposed bridge are considered.

Based on the field survey results, two SCI birds were identified within the area of the Proposed Scheme, namely *golden plover and northern lapwing.* Suitable habitat in the form of agricultural grassland and arable are also widely available within the footprint and immediate environs of the Proposed Scheme (see also **Section 6.5.1.1.1**). Therefore, they are most at risk to connectivity impacts (i.e. barriers).

In relation to the remaining SCI birds, namely: redshank, shelduck, oystercatcher, grey plover, knot, sanderling black-tailed godwit, turnstone and little tern they are unlikely to occur within the footprint and immediate environs of the Proposed Scheme owing to their coastal and estuarine habitat preference. Further to this, no evidence of these SCI birds were noted during field surveys. Therefore, they are not considered at risk to connectivity impacts (i.e. barriers).

As detailed in **Section 6.4.1.1.1**, there is no requirement for instream works with the bridge crossing having more than adequate freeboard for the movement of birds. In relation to noise emissions and artificial lighting, as detailed in **Section 6.5.1.1.1**, it is highly likely that displaced golden plover and northern lapwing in the presence of any disturbance will be able to relocate to proximal habitat that offers similar feeding opportunities, such as prey abundance. Furthermore, as described in **Section 6.7**, no in-combination effects have been identified that may interact with proximal suitable SCI habitat.

Golden plover and northern lapwing are both considered habituated to the presence of noise and human activity, given the presence and location of the current bridge at Slane, high traffic volumes and walking trails along the River Boyne. However, the proposed bridge works are still a source of artificial lighting which is required to complete the construction phase (intermittent lighting associated with night time working).

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to ensure artificial lighting** will not cause

barriers to connectivity to commuting and foraging SCI birds (golden plover and northern lapwing) during the construction phase.

6.5.1.1.3 Habitat Area

Wetlands have been screened in for assessment under the conservation attribute '*habitat area'* during the construction phase. Potential impacts have been identified as a result of surface water run-off (sediment and pollutants). Adverse effects would be indirect (downstream sedimentation/ pollution).

The Proposed Scheme does not require habitat loss in the form of estuarine wetlands. However, habitat deterioration as a result of water pollution may contribute to habitat loss in the long-term (i.e. there is potential for the rate of sedimentation deposition or erosion to influence wetland habitat area).

Impacts are predicted the same as those detailed under **Section 6.3.1.1.1.1**. Therefore, applying the precautionary principle and in the absence of sediment transport modelling and mitigation measures to control water pollution, adverse impacts on site integrity cannot be ruled out.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (sedimentation and pollution)** and consequently the downstream habitat area of wetland habitat during the construction phase.

6.5.1.2 Operational Phase

6.5.1.2.1 Population Trend

A number of SCI birds have been screened in for assessment under the conservation attribute '*population trend'* during the operational phase. As described in **Section 6.5.1.1.1**, potential impacts are considered under two headings; impacts within the footprint and/or immediate environs of the scheme, and impacts associated with downstream supporting habitat.

Additionally, as described in **Section 6.3.1.2**, potential impacts have been identified as a result of surface water run-off (sediment and pollutants) on the conservation objective targets of downstream intertidal habitat as part of the Boyne Estuary SAC, and therefore, the SCI birds of the Boyne Estuary SPA which utilise these habitats. However, the potential for adverse effects are considered differently during the operational phase.

During the operational phase, in the absence of mitigation measures it is predicted that there will be no significant changes in water quality which would be significant or contributory to the SPA; particularly due to the operational design of the project, the spatial separation of the Proposed Scheme from the SPA and the dilutionary effect of both the freshwater and estuarine environment.

6.5.1.2.1.1 Impacts within the Footprint and/or immediate Environs of the Proposed Scheme

During the operational phase, impacts are predicted to be the same as those described under **Section 6.5.1.1.1.1.** However, impacts are associated with light spill from the operation of the newly proposed mainline, roundabouts and the cycleway/pedestrian link bridge coming off the main bridge down to the towpath. There is potential for artificial lighting associated with the Proposed Scheme to spill onto suitable agricultural grassland and arable land used by these two SCI species, but is not considered to result in any adverse effects.

One additional impact has also been identified during this phase – potential for bird strike risk, however during wintering bird surveys, lapwing and golden plover were primarily recorded flying over the Proposed Scheme area rather than using habitat within the footprint or immediate environs of the scheme (see Table 4 3).

In terms of any known collision risk of golden plover and northern lapwing with man- made structures, much of the literature derives from one-off studies of individual installations carried out or commissioned by developers or other interested and concerned parties. However, given the presence of the existing Slane bridge, the location of the proposed bridge crossing approx. 600 m east of this, existing structures throughout the River Boyne corridor (i.e. Newgrange Monument bridge crossing, Mary McAleese Boyne Valley Bridge, Drogheda Bridge crossings and Boyne Viaduct), and lowest soffit level proposed for the bridge providing more than adequate freeboard (12 m above median river levels), it is not anticipated that the bridge crossing will contribute to any adverse effects to site integrity.

Adverse effects to site integrity can be ruled out as a result of from the Proposed Scheme. Therefore, **mitigation is not required.**

6.5.1.2.1.1 Impacts Associated with Downstream Supporting Habitat

During the operational phase, impacts are predicted to be the same as those described under **Section 6.5.1.1.1.1**. However, impacts are associated during this phase with operational road run-off and drainage pollution including suspended solids, heavy metals and hydrocarbons.

Run-off will be directed via attenuation basins containing sections of constructed surface flow wetlands, planted with appropriate native aquatic vegetation. As such, these attenuation ponds/wetlands will be used to treat the run-off from the roadway before it is directed to the River Boyne and the Mattock (Mooretown) stream. The Proposed Scheme design also provides for a treatment train incorporating grassed channels, vortex grit separators and petrol/oil interceptors.

Maintenance activities will largely include visual inspections from the mainline, from ground level below the bridge and by boat. Surface drainage maintenance will be the most frequent task and ensures drainage structures are functioning as intended. Aggregation of silt captured within drainage during cleaning may bring about increases in the siltation of surface water, and potentially adverse effects.

It is recognised that during the operational phase, run-off will be directed via attenuation basins and other road drainage features, which will remove significant sources of unattenuated road run-off pollution as part of the design of the Proposed Scheme. Adverse effects to site integrity are not predicted and **precautionary mitigation measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

6.5.1.2.2 Distribution

A number of SCI birds have been screened in for assessment under the conservation attribute '*distribution*' during the construction phase. Impacts are predicted to be the same as those detailed in **Section 6.5.1.2.1**.

In the absence of mitigation, **adverse effects to site integrity can be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is not required in relation to artificial lighting** during the operational phase.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to prevent impacts on water quality (sedimentation and pollution)** and consequently population trends of SCI birds (redshank, shelduck, oystercatcher, grey plover, knot, sanderling black-tailed godwit, turnstone and little tern) during the construction phase.

6.5.1.2.3 Prey Biomass Available

A number of SCI birds have been screened in for assessment under the conservation attribute '*prey biomass available*' during the construction phase. Impacts are predicted to be the same as those detailed in **Section 6.5.1.2.1**.Adverse effects to site integrity are not predicted and **precautionary mitigation measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

6.5.1.2.4 Barriers to Connectivity

Golden plover and northern lapwing have been screened in for assessment under the conservation attribute '*barriers to connectivity*' during the operational phase. Impacts are predicted to be similar to those as detailed in **Section 6.4.1.2.2** and **Section 6.5.1.2.1**.

Therefore, in the absence of mitigation, **adverse effects to site integrity can be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is not required in relation to artificial lighting** during the operational phase.

6.5.1.2.5 Habitat Area

Wetlands have been screened in for assessment under the conservation attribute '*habitat area'* during the operational phase. Potential impacts have been identified as a result of surface water run-off (sediment and pollutants). Adverse effects would be indirect (downstream sedimentation/ pollution).

The scale of structures and drainage features involved means there is widespread potential for the release of sediment and pollutants during the operational phase. Potential road drainage pollution includes suspended solids, heavy metals and hydrocarbons.

Run-off will be directed via attenuation basins containing sections of constructed surface flow wetlands, planted with appropriate native aquatic vegetation. As such, these attenuation ponds/wetlands will be used to treat the run-off from the roadway before it is directed to the River Boyne and the Mattock (Mooretown) stream. Mitigation will however be required in the form of hydrocarbon interceptors and vortex grit separators prior to the release of water into attenuation ponds.

Maintenance activities will largely include visual inspections with surface drainage maintenance being the most frequent task. During this maintenance activity, aggregation of silt captured within drainage during cleaning may bring about increases in the siltation of surface water (see **Section 6.4.1.2.1**). Therefore, in the absence of mitigation measures and sediment modelling during the operational phase, adverse effects on site integrity cannot be ruled out.

In the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required to prevent impacts on water quality (pollution and sedimentation)** and consequently wetland habitat area during the operational phase.

6.6 North-west Irish Sea SPA

6.6.1 Assessment Against Relevant Conservation Objectives

Site-specific conservation objectives for the North-west Irish Sea SPA were reviewed (NPWS, 2023a) (see **Section 5.2.1.5**). The prediction of adverse effects on site integrity for 'relevant' site-specific attributes and QIs scoped into the assessment during the construction and operation of the Proposed Scheme are outlined in **Table 6-5**.

Table 6-5: Prediction of Effects on Site Integrity (QIs) of the North-west Irish Sea SPA during all phases of the Proposed Scheme

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2023a; Version 1 19/09/2023)	Target
Red-throated Diver *Gavia stellata* [A001]	Water pollution (i.e. sedimentation and contaminants); and disturbance (i.e. noise, vibration, human presence and lighting).	-	**Non-breeding population size** Potential identified.	No significant decline.
			Spatial distribution None predicted. The Proposed Scheme will not interfere with the number of locations, area or availability of suitable habitat for red-throated diver.	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population.
			Forage spatial distribution, extent and abundance Potential identified.	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
			Disturbance across the site None predicted. The Proposed Scheme will not result in any disturbance in the form of noise, vibration, human presence and lighting to red-throated diver potentially using suitable habitat downstream of the Proposed Scheme.	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.
			Barriers to connectivity and site use None predicted. Red-throated diver would only occur inland during the breeding season, therefore the Proposed Scheme does not provide supporting habitat and barriers to connectivity/site use has been ruled out.	The number, location, shape and area of barriers do not significantly impact the site population's access to the SPA or other ecologically important sites outside the SPA.
Cormorant *Phalacrocorax carbo* [A017]			**Breeding population size** Potential identified.	Long term population trend within the SPA is stable or increasing.
			Spatial distribution Potential identified.	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population.
			Forage spatial distribution, extent, abundance and availability Potential identified.	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
			Disturbance across the site Potential identified.	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2023a; Version 1 19/09/2023)	Target
			Barriers to connectivity Potential identified.	The number, location, shape and area of barriers do not significantly impact the site population's access to the SPA or other ecologically important sites outside the SPA.
Shag *Phalacrocorax aristotelis* [A018]			**Breeding population size** Potential identified.	Long term SPA population trend is stable or increasing.
			Spatial distribution None predicted. The Proposed Scheme will not interfere with the number of locations, area or availability of suitable habitat for shag.	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population.
			Forage spatial distribution, extent, abundance and availability Potential identified.	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
			Disturbance across the site None predicted. The Proposed Scheme will not result in any disturbance in the form of noise, vibration, human presence and lighting to shag potentially using suitable habitat downstream of the Proposed Scheme.	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution
			Barriers to connectivity None predicted. Based on its habitat preference this species would occur within coastal cliff, marine and rocky habitat for which the Proposed Scheme does not support. Therefore, there is no potential for the Proposed Scheme to result in barriers to connectivity for shag.	The number, location, shape and area of barriers do not significantly impact the population's access to the SPA or other ecologically important sites outside the SPA.
Common Scoter *Melanitta nigra* [A065]			**Non-breeding population size** Potential identified.	No significant decline.
			Spatial distribution None predicted. The Proposed Scheme will not interfere with the number of locations, area or availability of suitable habitat for common scoter.	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population.
			Forage spatial distribution, extent and abundance Potential identified.	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2023a; Version 1 19/09/2023)	Target
			Disturbance across the site None predicted. The Proposed Scheme will not result in any disturbance in the form of noise, vibration, human presence and lighting to common scoter potentially using suitable habitat downstream of the Proposed Scheme.	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution
			Barriers to connectivity and site use None predicted. Based on its habitat preference this species would occur within shallow sea and sandy bay habitat for which the Proposed Scheme does not support. Therefore, there is no potential for the Proposed Scheme to result in barriers to connectivity for common scoter.	The number, location, shape and area of barriers do not significantly impact the site population's access to the SPA or other ecologically important sites outside the SPA.
Little Gull *Larus minutus* [A177]			**Breeding population size** Potential identified.	No significant decline.
			Spatial distribution None predicted. The Proposed Scheme will not interfere with the number of locations, area or availability of suitable habitat for little gull.	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population.
			Forage spatial distribution, extent, abundance and availability Potential identified.	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
			Disturbance across the site None predicted. The Proposed Scheme will not result in any disturbance in the form of noise, vibration, human presence and lighting to little gull potentially using suitable habitat downstream of the Proposed Scheme.	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.
			Barriers to connectivity None predicted. Based on its habitat preference this species would occur within shallow sea and coastal habitat for which the Proposed Scheme does not support. Therefore, there is no potential for the Proposed Scheme to result in barriers to connectivity for common scoter.	The number, location, shape and area of barriers do not significantly impact the site population's access to the SPA or other ecologically important sites outside the SPA.
			Non-breeding population size	No significant decline.

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2023a; Version 1 19/09/2023)	Target
Black-headed Gull *Chroicocephalus ridibundus* [A179]			Potential identified.	
			Spatial distribution Potential identified.	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population.
			Forage spatial distribution, extent and abundance Potential identified.	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
			Disturbance across the site Potential identified.	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.
			Barriers to connectivity and site use Potential identified.	The number, location, shape and area of barriers do not significantly impact the site population's access to the SPA or other ecologically important sites outside the SPA.
Common Gull *Larus canus* [A182]			**Non-breeding population size** Potential identified.	No significant decline.
			Spatial distribution None predicted. The Proposed Scheme will not interfere with the number of locations, area or availability of suitable habitat for common gull.	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population.
			Forage spatial distribution, extent and abundance Potential identified.	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
			Disturbance across the site None predicted. The Proposed Scheme will not result in any disturbance in the form of noise, vibration, human presence and lighting to common gull potentially using suitable habitat downstream of the Proposed Scheme.	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.
			Barriers to connectivity and site use None predicted. Based on its habitat preference this species would occur within shingle beach and coastal habitat for which the Proposed Scheme does not support. Therefore, there is no potential for the	The number, location, shape and area of barriers do not significantly impact the site population's access to the SPA or other ecologically important sites outside the SPA.

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2023a; Version 1 19/09/2023)	Target
			Proposed Scheme to result in barriers to connectivity for common gull.	
Lesser Black-backed Gull *Larus fuscus* [A183]			**Breeding population size** Potential identified.	No significant decline.
			Spatial distribution Potential identified.	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population.
			Forage spatial distribution, extent, abundance and availability Potential identified.	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
			Disturbance across the site Potential identified.	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.
			Barriers to connectivity Potential identified.	The number, location, shape and area of barriers do not significantly impact the site population's access to the SPA or other ecologically important sites outside the SPA.
Herring Gull *Larus argentatus* [A184]			**Population size** Potential identified.	Long term SPA population trend is stable or increasing
			Spatial distribution Potential identified.	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population.
			Forage spatial distribution, extent, abundance and availability Potential identified.	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
			Disturbance across the site Potential identified.	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.
			Barriers to connectivity Potential identified.	The number, location, shape and area of barriers do not significantly impact the site population's access to the SPA or other ecologically important sites outside the SPA.

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2023a; Version 1 19/09/2023)	Target
Great Black-backed Gull *Larus marinus* [A187]			**Non-breeding population size** Potential identified.	No significant decline.
			Spatial distribution None predicted. The Proposed Scheme will not interfere with the number of locations, area or availability of suitable habitat for great black-backed gull.	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population.
			Forage spatial distribution, extent and abundance Potential identified.	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
			Disturbance across the site None predicted. The Proposed Scheme will not result in any disturbance in the form of noise, vibration, human presence and lighting to great black-backed gull potentially using suitable habitat downstream of the Proposed Scheme.	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.
			Barriers to connectivity and site use None predicted. Based on its habitat preference this species would occur within coastal shallow marine waters and estuarine habitat for which the Proposed Scheme does not support. Therefore, there is no potential for the Proposed Scheme to result in barriers to connectivity for great black-backed gull.	The number, location, shape and area of barriers do not significantly impact the wintering population's access to the SPA or other ecologically important sites outside the SPA.
Common Tern *Sterna hirundo* [A193]			**Breeding population size** Potential identified.	No significant decline.
			Spatial distribution None predicted. The Proposed Scheme will not interfere with the number of locations, area or availability of suitable habitat for common tern.	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population.
			Forage spatial distribution, extent, abundance and availability Potential identified.	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
			Disturbance across the site	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2023a; Version 1 19/09/2023)	Target
			None predicted. The Proposed Scheme will not result in any disturbance in the form of noise, vibration, human presence and lighting to common tern potentially using suitable habitat downstream of the Proposed Scheme.	impact the achievement of targets for population size and spatial distribution.
			Barriers to connectivity None predicted. Based on its habitat preference this species would occur within open-water habitat in the form of coastal or freshwater lakes for which the Proposed Scheme does not support. Therefore, there is no potential for the Proposed Scheme to result in barriers to connectivity for common tern.	The number, location, shape and area of barriers do not significantly impact the site population's access to the SPA or other ecologically important sites outside the SPA.
Arctic Tern *Sterna paradisaea* [A194]			**Breeding population size** Potential identified.	No significant decline.
			Spatial distribution None predicted. The Proposed Scheme will not interfere with the number of locations, area or availability of suitable habitat for Arctic tern.	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population.
			Forage spatial distribution, extent, abundance and availability Potential identified.	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
			Disturbance across the site None predicted. The Proposed Scheme will not result in any disturbance in the form of noise, vibration, human presence and lighting to Arctic tern potentially using suitable habitat downstream of the Proposed Scheme.	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.
			Barriers to connectivity None predicted. Based on its habitat preference this species would occur within open-water freshwater lake habitat and coastal habitat for which the Proposed Scheme does not support. Therefore, there is no potential for the Proposed Scheme to result in barriers to connectivity for Arctic tern.	The number, location, shape and area of barriers do not significantly impact the site population's access to the SPA or other ecologically important sites outside the SPA.
Little Tern *Sterna albifrons* [A195]			**Breeding population size** Potential identified.	No significant decline.

Relevant Qualifying Interest	Effect pathway(s)	Relevant Site-level Threat	Potential for adverse effect(s) on the CO attributes of relevant QIs (NPWS, 2023a; Version 1 19/09/2023)	Target
			Spatial distribution None predicted. The Proposed Scheme will not interfere with the number of locations, area or availability of suitable habitat for little tern.	Sufficient number of locations, area, and availability (in terms of timing and intensity of use) of suitable habitat to support the population.
			Forage spatial distribution, extent, abundance and availability Potential identified.	Sufficient number of locations, area of suitable habitat and available forage biomass to support the population target.
			Disturbance across the site None predicted. The Proposed Scheme will not result in any disturbance in the form of noise, vibration, human presence and lighting to little tern potentially using suitable habitat downstream of the Proposed Scheme.	The intensity, frequency, timing and duration of disturbance occurs at levels that do not significantly impact the achievement of targets for population size and spatial distribution.
			Barriers to connectivity None predicted. Based on its habitat preference this species would occur within shingle beach and coastal habitat which the Proposed Scheme does not support. Therefore, there is no potential for the Proposed Scheme to result in barriers to connectivity for little tern.	The number, location, shape and area of barriers do not significantly impact the site population's access to the SPA or other ecologically important sites outside the SPA.

6.6.1.1 Construction Phase

6.6.1.1.1 Non-Breeding Population Size; Breeding Population Size; Population Size; Forage Spatial Distribution, Extent and Abundance

A number of SCI birds have been screened in for assessment under the conservation attribute 'non-breeding population size' (black-headed gull, red-throated diver, common scoter, common gull and great black-backed gull), 'population size' (herring gull), 'breeding population size' (cormorant, shag, little gull, lesser black-backed gull, common tern, Arctic tern and little tern) and 'forage spatial distribution, extent and abundance' (the thirteen aforementioned SCI species) during the construction phase.

Firstly, potential impacts have been identified as a result of disturbance within the footprint and/or immediate environs of the Proposed Scheme in relation to black-headed gull (i.e. uses arable land and riverine habitat to forage), cormorant, lesser black-backed gull and herring gull, (i.e. all of which use riverine habitat). These species were noted during field surveys (see **Section 4.6**).

Based on the information available, it can't be confirmed whether these potential populations within and adjacent to the Proposed Scheme are part of the populations from the SPA. However, as a precautionary measure it has been assumed that they could potentially be ex-situ populations of the SPA since such species are known to use both coastal/estuarine and inland areas as part of their foraging behaviour/roosting. Adverse effects would be direct (displacement). These species also forage on fish within riverine systems and have additionally been considered here for impacts related to water pollution (i.e. indirect effects on food supply such as fish).

Secondly, potential impacts have been identified as a result of water pollution (sedimentation and pollutants) on downstream supporting inter-tidal, estuarine and coastal habitat, used by the following birds: black-headed gull, red-throated diver, common scoter, common gull, great black-backed gull, herring gull, cormorant, shag, little gull, lesser black-backed gull, common tern, Arctic tern and little tern (see **Table 4-9**). Given the spatial separation of the Proposed Scheme from the SPA and the contribution of dilution, it is not considered that any impacts arising in their own right as a result of the Proposed Scheme would be so significant to result in noticeable habitat deterioration, modification or alteration as a result of water pollution. Rather, it is envisaged that any impacts would be contributory to any existing threats to the SPA.

There is potential for sediment and pollutants to be transported downstream over time and, if this did occur, there is likely to be a lag between the impact occurring and the effect occurring at the SPA. It is considered that the risk of a contributory affect to the SPA is low even in the absence of mitigation. However, this impact and potential effects have been assessed on a precautionary basis. Adverse effects would be indirect (downstream sedimentation/ pollution).

6.6.1.1.1.1 Impacts within the Footprint and/or Immediate Environs of the Proposed Scheme

The Proposed Scheme has the potential to cause disturbance to commuting and foraging black-headed gull cormorant, lesser black-backed gull and herring gull which are likely to occur within the footprint and/or immediate environs of the Proposed Scheme, owing to the presence of suitable habitat. Suitable habitats include arable land and riverine habitat. Disturbance includes the physical presence of the bridge itself (see also **Section 6.5.1.1.2**), newly proposed mainline, noise/vibration emissions, human presence and artificial lighting which may result in their displacement. The ZoI for disturbance on commuting and foraging birds (black-headed gull cormorant, lesser black-backed gull and herring gull) is considered to be within the footprint and 2 km of the Proposed Scheme.

In terms of potential impacts as a result of noise/vibration emissions and presence of the bridge - arable land and riverine habitat are both considered widely distributed and available within the environs at Slane and are considered highly likely to utilise alternative habitats. Therefore, it is highly likely that displaced black-headed gull cormorant, lesser black-backed gull and herring gull will be able to relocate to proximal habitat that offers similar feeding opportunities, such as prey abundance. During wintering bird surveys, these species were primarily recorded flying over the Proposed Scheme area rather than using habitat within the footprint or immediate environs of the scheme (see **Table 4-8**). Furthermore, as described in **Section 6.7**, no in-combination effects have been identified that may interact with proximal suitable SCI habitat.

In relation to artificial lighting, construction works, in general, will be undertaken during normal daylight working hours. However, some night time work is expected (albeit intermittent) to facilitate safe working conditions. The effect of artificial illumination on these species are relatively unknown but there is potential

for light spill to deter or alter behaviour/movements of SCI birds within the immediate River Boyne corridor and the wider scheme, particularly where areas were previously undisturbed (Boyne crossing). BCT (2014) have suggested that artificial lighting can be associated with several aspects of changes to bird behaviour and could disrupt the long-term circadian rhythm that dictates the onset of the breeding season. In the absence of appropriate mitigation, there is potential for adverse impacts on site integrity.

Water quality impacts within the footprint of the Proposed Scheme also have the potential to arise as a result of contaminated surface water and/or an accidental pollution event. Impacts on food availability can have a negative effect on the survival and abundance of SCI bird populations. Furthermore, during the construction phase, attenuation basins/wetlands are to be fully operational for the attenuation / settlement of site run-off. This will greatly reduce the risk of untreated or uncontrolled discharges entering the watercourses during the construction phase and is seen as a critical step in avoiding and preventing potentially significant impacts on the River Boyne. It is considered that the risk of a contributory affect to the River Boyne is low even in the absence of mitigation. However, the precautionary principle has been applied.

Therefore, in the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to ensure artificial lighting and impacts on water quality (sedimentation and pollution)** will not cause an impact on the non-breeding population (black-headed gull), breeding population (cormorant and lesser black-backed gull), population size (herring hull) and forage spatial distribution, extent and abundance of SCI birds during the construction phase.

6.6.1.1.1.2 Impacts Associated with Downstream Habitat

The Proposed Scheme has, at most, a low risk potential to cause water pollution which may indirectly effect food resources (i.e. small fish, crustaceans and macroinvertebrates) available to SCI birds (black-headed gull, red-throated diver, common scoter, common gull, great black-backed gull, cormorant, shag, little gull, lesser black-backed gull, common tern, Arctic tern, little tern and herring gull) using habitat within the Boyne Estuary and Boyne coastal water body. Water quality impacts have the potential to arise as a result of contaminated surface water and/or an accidental pollution event.

Impacts on food availability can have a negative effect on the survival and abundance of SCI bird populations. Furthermore, water pollution may also contribute to changes in the sediment regime of inter-tidal habitats, therefore causing habitat deterioration which is linked with population trends and prey availability (forage distribution).

During the construction phase, attenuation basins/wetlands are to be fully operational for the attenuation / settlement of site run-off. This will greatly reduce the risk of untreated or uncontrolled discharges entering the watercourses during the construction phase and is seen as a critical step in avoiding and preventing potentially significant impacts on the River Boyne. Furthermore, as described under **Section 6.5.1.1.1**, it is not considered that any impacts arising in their own right as a result of the Proposed Scheme would be so significant to result in noticeable habitat deterioration, modification or alteration as a result of water pollution. Rather, it is envisaged that any impacts would be contributory to any existing threats to the SPA. It is considered that the risk of a contributory affect to the SPA is low even in the absence of mitigation. However, the precautionary principle has been applied.

Therefore, in the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. **Mitigation is required in order to prevent impacts on water quality (sedimentation and pollution)** and consequently population trends of SCI birds (black-headed gull, red-throated diver, common scoter, common gull, great black-backed gull, cormorant, shag, little gull, lesser black-backed gull, common tern, Arctic tern, little tern and herring gull) during the construction phase.

6.6.1.1.2 Spatial Distribution; Disturbance Across the Site

Cormorant, herring gull, lesser black-backed gull and black-headed gull have been screened in for assessment under the conservation attribute '*spatial distribution*' and '*disturbance across the site'* during the construction phase.

Potential impacts have been identified on cormorant, lesser black-backed gull, black-backed gull and herring gull as a result of disturbance and therefore spatial distribution. As detailed above under **Section 6.5.1.2.1.1**, disturbance includes the physical presence of the bridge itself, newly proposed mainline, noise/vibration emissions, human presence and artificial lighting. Impacts are predicted to be the same as those described under **Section 6.5.1.2.1.1.**

Therefore, in the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to ensure artificial lighting** will not cause an impact on spatial distribution and disturbance of cormorant, herring gull, lesser black-backed gull and black-headed gull within the site of the Proposed Scheme during the construction phase.

6.6.1.1.3 Barriers to Connectivity; Barriers to Connectivity and Site Use

Cormorant, lesser black-backed gull and black-headed gull have been screened in for assessment under the conservation attribute '*barriers to connectivity'* and herring gull has been screened in for assessment under the conservation attribute '*barriers to connectivity and site use'* during the construction phase.

Potential impacts have been identified on cormorant, lesser black-backed gull, black-backed gull and herring gull as a result of displacement (specifically the proposed bridge crossing and associated works), which are known to be commuting and foraging in the area. Barriers to connectivity come in the form of the physical presence of the bridge itself, noise/vibration emissions (which includes human presence) and artificial lighting. Adverse effects would be direct. No adverse effects as a result of the erection of the proposed bridge are considered.

Based on the field survey results, these SCI birds were identified flying over the area of the Proposed Scheme. Suitable habitat in the form of riverine habitat and arable land are also widely available within the footprint and immediate environs of the Proposed Scheme. Therefore, they are most at risk to connectivity impacts (i.e. barriers).

In relation to the remaining SCI birds of the North-west Irish Sea SPA, namely: red-throated diver, common scoter, common gull, great black-backed gull, shag, little gull, common tern, Arctic tern and little tern, they are unlikely to occur within the footprint and immediate environs of the Proposed Scheme owing to their coastal and estuarine habitat preference. Further to this, only two of these species (i.e. little gull and great black-backed gull) were noted during field surveys, and were noted only flying over the site of the Proposed Scheme. Therefore, they are not considered at risk to connectivity impacts (i.e. barriers).

As detailed in **Section 6.4.1.1.1**, there is no requirement for instream works with the bridge crossing having more than adequate freeboard for the movement of birds. In relation to noise emissions and artificial lighting, as detailed in **Section 6.5.1.1.1**, it is highly likely that displaced cormorant, lesser black-backed gull, black-backed gull and herring gull in the presence of any disturbance will be able to relocate to proximal habitat that offers similar feeding opportunities, such as prey abundance. Furthermore, as described in **Section 6.7**, no in-combination effects have been identified that may interact with proximal suitable SCI habitat.

Cormorant, lesser black-backed gull, black-backed gull and herring gull are all considered habituated to the presence of noise and human activity, given the presence and location of the current bridge at Slane, high traffic volumes and walking trails along the River Boyne. However, the proposed bridge works are still a source of artificial lighting which is required to complete the construction phase (intermittent lighting associated with night time working).

Therefore, in the absence of mitigation, **adverse effects to site integrity cannot be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is required in order to ensure artificial lighting** will not cause barriers to connectivity to commuting and foraging SCI birds (cormorant, lesser black-backed gull, black-backed gull and herring gull) during the construction phase.

6.6.1.2 Operational Phase

6.6.1.2.1 Non-Breeding Population Size; Breeding Population Size; Population Size; Forage Spatial Distribution, Extent and Abundance

A number of SCI birds have been screened in for assessment under the conservation attribute 'non-breeding population size' (black-headed gull, red-throated diver, common scoter, common gull and great black-backed gull), 'population size' (herring gull), 'breeding population size' (cormorant, shag, little gull, lesser black-backed gull, common tern, Arctic tern and little tern) and 'forage spatial distribution, extent and abundance' (the thirteen aforementioned SCI species) during the operational phase.

As described in **Section 6.6.1.1.1**, potential impacts are considered under two headings; impacts within the footprint and/or immediate environs of the scheme, and impacts associated with downstream supporting habitat.

Additionally, as described above, potential impacts have been identified as a result of surface water run-off (sediment and pollutants) on downstream intertidal and coastal habitat, and therefore, the SCI birds of the North-west Irish Sea SPA which utilise these habitats. However, the potential for adverse effects are considered differently during the operational phase.

During the operational phase, in the absence of mitigation measures it is predicted that there will be no significant changes in water quality which would be significant or contributory to the SPA; particularly due to the operational design of the project, the spatial separation of the Proposed Scheme from the SPA and the dilutionary effect of both the freshwater and estuarine environment.

6.6.1.2.1.1 Impacts within the Footprint and/or Immediate Environs of the Proposed Scheme

During the operational phase, impacts are predicted to be the same as those described under **Section 6.6.1.1.1.1.** However, impacts are associated with light spill from the operation of the newly proposed mainline, roundabouts and the cycleway/pedestrian link bridge coming off the main bridge down to the towpath. There is potential for artificial lighting associated with the Proposed Scheme to spill onto suitable arable land and riverine habitat used by these SCI species, however no adverse effects are predicted.

One additional impact has also been identified during this phase – potential for bird strike risk, however during wintering bird surveys, black-headed gull cormorant, lesser black-backed gull and herring gull were primarily recorded flying over the Proposed Scheme area rather than using habitat within the footprint or immediate environs of the scheme (see **Table 4-9**).

In terms of any known collision risk of these SCI birds with man- made structures, much of the literature derives from one-off studies of individual installations carried out or commissioned by developers or other interested and concerned parties. However, given the presence of the existing Slane bridge, the location of the proposed bridge crossing approx. 600 m east of this, existing structures throughout the River Boyne corridor (i.e. Newgrange Monument bridge crossing, Mary McAleese Boyne Valley Bridge, Drogheda Bridge crossings and Boyne Viaduct), and lowest soffit level proposed for the bridge providing more than adequate freeboard (12 m above median river levels), it is not anticipated that the bridge crossing will contribute to any adverse effects to site integrity.

In the absence of mitigation, **adverse effects to site integrity can be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is not required in relation to artificial lighting** and it will not cause an impact on the non-breeding population (black-headed gull), breeding population (cormorant and lesser black-backed gull), population size (herring hull) and forage spatial distribution, extent and abundance of SCI birds during the operational phase.

6.6.1.2.1.2 Impacts Associated with Downstream Habitat

During the operational phase, impacts are predicted to be the same as those described under **Section 6.6.1.1.1.2**. However, impacts are associated during this phase with operational road run-off and drainage pollution including suspended solids, heavy metals and hydrocarbons.

Run-off will be directed via attenuation basins containing sections of constructed surface flow wetlands, planted with appropriate native aquatic vegetation. As such, these attenuation ponds/wetlands will be used to treat the run-off from the roadway before it is directed to the River Boyne and the Mattock (Mooretown) stream. The Proposed Scheme design also provides for a treatment train incorporating grassed channels, vortex grit separators and petrol/oil interceptors.

Maintenance activities will largely include visual inspections from the mainline, from ground level below the bridge and by boat. Surface drainage maintenance will be the most frequent task and ensures drainage structures are functioning as intended. Aggregation of silt captured within drainage during cleaning may bring about increases in the siltation of surface water, and potentially adverse effects.

It is recognised that during the operational phase, run-off will be directed via attenuation basins and other road drainage features, which will remove significant sources of unattenuated road run-off pollution as part of the design of the Proposed Scheme. Adverse effects to site integrity are not predicted and **precautionary mitigation measures have been incorporated into Section 7.4** to ensure drainage features function effectively and are subject to regular inspection and maintenance.

6.6.1.2.2 Spatial Distribution; Disturbance Across the Site

Cormorant, herring gull, lesser black-backed gull and black-headed gull have been screened in for assessment under the conservation attribute '*spatial distribution*' and '*disturbance across the site'* during the operational phase. Impacts are predicted to be the same as those described under **Section 6.6.1.2.1.1.**

Therefore, in the absence of mitigation, **adverse effects to site integrity can be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is not required in relation to artificial lighting** and it will not cause an impact on spatial distribution and disturbance of cormorant, herring gull, lesser black-backed gull and black-headed gull within the site of the Proposed Scheme during the operational phase.

6.6.1.2.3 Barriers to Connectivity; Barriers to Connectivity and Site Use

Cormorant, lesser black-backed gull and black-headed gull have been screened in for assessment under the conservation attribute '*barriers to connectivity'* and herring gull has been screened in for assessment under the conservation attribute '*barriers to connectivity and site use'* during the operational phase. Impacts are predicted to be similar to those as detailed **Section 6.6.1.1.3**

Therefore, in the absence of mitigation, **adverse effects to site integrity can be ruled out** as a result of the Proposed Scheme. Therefore, **mitigation is not required in relation to artificial lighting** and it will not cause barriers to connectivity to commuting and foraging SCI birds (cormorant, lesser black-backed gull, black-backed gull and herring gull) during the operational phase.

6.7 In-combination Effects

6.7.1 Methodology

Legislation, guidance and case law (see **Section 1.2** and **Section 3.1**) requires that in-combination effects with other plans or projects are considered. On this basis, a range of other plans and projects were considered in terms of their potential to have in-combination effects with the Proposed Scheme.

The assessment of in-combination effects has regard for existing and planned developments potentially affecting the River Boyne and River Blackwater SAC, the River Boyne and River Blackwater SPA and the Boyne Estuary SPA with which a potential pathway has been identified in the foregoing sections of this NIS above. The assessment of existing developments is presented in **Sections 5** and **6**. The assessment of planned developments is presented below.

RPS undertook a desk study to source publicly available information on plans, projects and activities within the defined ZoI using internet searches, planning databases and other available sources to identify other plans, projects and activities falling within the ZoI, which may have the potential to give rise to cumulative effects with the Proposed Scheme.

A search was conducted of national, regional and local plans which were deemed relevant to the Proposed Scheme. This list is not exhaustive of all plans and programmes, but instead focuses on those which may result in potential for adverse in-combination effect.

6.7.2 Plans

6.7.2.1 National Development Plan

The Department of Public Expenditure and Reform (DPER) have launched the new *National Development Plan* (NDP), which covers the period from 2021-2030 and is the primary infrastructure investment plan adopted by the Government (DPER, 2021). The new NDP is aligned with the delivery of the National Planning Framework: Ireland 2040 objectives and sets out the State's investment priorities to 2030 within the context of a changing demographic, the need for Ireland to move to a low carbon society, Brexit and the sustainable growth opportunities brought about by a growing population. The NDP 2021-2030 designates a number of National Strategic Outcomes and Priorities of the plan including Enhanced Regional Accessibility, Compact Growth and Sustainable Mobility.

The NDP recognises that the national roads network is a key backbone for both sustainable mobility and private transport provision across the country. It highlights the need for targeted investment in transport and

road infrastructure, including the development of inter-urban roads and by-passes of regional town centres. Investment priorities over the period 2021-2030 assign €8 billion to the protection and renewal of national, regional and local roads, with continued investment in major road projects from the previous plan. Since 2018, a number of important national road projects have been built and completed under the NDP. A number of national road projects that were part of the previous NDP and are subject to further approval are listed in the latest NDP including the "N2 Slane Bypass".

The Strategic Priorities of the NDP carry the potential for in-combination impacts with the Proposed Scheme on a variety of potential receptors, through pathways of habitat fragmentation/destruction, increased disturbance, and surface/groundwater pollution. Such individual projects arising from these priorities will, however, be subject to their own AA requirements. The NDP 2021-2030 also sets biodiversity as a priority (i.e. Enhanced Amenity and Heritage – National Strategic outcome 7).

Thus, the in-combination impacts from the National Development Plan 2021-2030 with the Proposed Scheme are not predicted.

6.7.2.2 National Planning Framework: Ireland 2040

The *National Planning Framework: Ireland 2040* (herein referred to as NPF 2040) is the primary articulation of spatial, planning and land use policy in Ireland (DHLGH, 2018). It is a long-term strategy for the next 20 years and it will focus on ensuring compatibility between future growth of cities/ towns within Ireland alongside environmental sustainability. It is intended that the NPF 2040 will both provide the focus to guide and inform future planning and set the framework for integrated investment decisions. The framework is based on directing development to existing settlements rather than allowing the continual expansion and sprawl of cities and towns. It provides each region with a set of objectives and key principles from which detailed plans are to be developed.

The NPF 2040 defines ten National Strategic Outcomes (NSOs) that represent a shared set of goals for every community across the country. NSOs of relevance to the N2 Slane bypass and potential for in-combination effects with the Proposed Scheme are:

- **NSO 1: Compact Growth.** This objective seeks to manage the sustainable growth of cities, towns, and villages to create compact and attractive places in which people can live and work. NSO 1 seeks to achieve effective densities and consolidation of built form rather than further sprawl of urban development;
- **NSO 2: Enhanced Regional Accessibility.** This objective seeks to achieve better accessibility between the four cities and to the Northern and Western region to enable unrealised potential to be activated as well as better preparing for potential impacts from Brexit. The Proposed Scheme will facilitate the development of the N-W region through greater accessibility and connectivity between Dublin and the North West. Enhancing the accessibility of the North West will enhance the competitiveness and attractiveness of areas most exposed to the potential impacts of Brexit and this is stated in the NPF as follows:

  "Upgrading access to the North West border area utilising existing routes (N2/A14/A5)."
- **NSO 3: Strengthening Rural Economies and Communities.** This requires development and diversification of the rural economy. The NPF specifically identifies the need to:

  "Invest maintaining regional and local roads and strategic road improvement projects in rural areas to ensure access to critical services such as education, healthcare and employment."

  The Proposed Scheme objective is to improve the function of Slane Village by removing long distance traffic including HGVs from the centre of the village allowing it to harness the opportunities presented by the natural and built heritage in the surrounding landscape including the Boyne River (designated as a European site) and the Brú na Bóinne UNESCO World Heritage Site.
- **NSO 4: Sustainable Mobility.** This objective is identified as being central to enhancing competitiveness, sustaining economic progress, and enabling mobility choices for citizens. Under NSO 4, the NPF 2040 aims to expand the range of public transport services available and to reduce congestion and emissions. The Proposed Scheme will facilitate greater options for the local community in Slane including enhanced pedestrian and cycling routes and space, links to wider facilities along the Boyne river towpath and wider regional cycling network.

- **NSO 7: Enhanced Amenities and Heritage**. This objective is defined as a combination of factors, including vitality and diversity of uses, ease of access to amenities and services supported by integrated transport systems and green modes of movement such as pedestrian and cycling facilities. Appealing places are also defined by their character, heritage and sense of community. The Proposed Scheme has been designed with these factors in mind including the nature of the bridge crossing of the River Boyne to the public realm design integrating with the heritage character of the wider landscape.

The NPF also contains National Policy Objectives (NPOs) for the protection of the environment and specifically European sites:

- **NPO 59: Enhance the conservation status and improve the management of protected areas and protected species by:**

  "Implementing relevant EU Directives to protect Ireland's environment and wildlife;

  "Developing and utilising licensing and consent systems to facilitate sustainable activities within Natura 2000 sites… "

There is potential for future development arising from the NPF, and the NSOs mentioned above, to give rise to in-combination effects with the Proposed Scheme through pathways such as habitat fragmentation/ destruction, increased disturbance, and surface/groundwater pollution. Individual projects, however, will be subject to their own AA requirements and specific mitigation measures will need to be identified and implemented at the project-level AA stage.

With the incorporation of these AA requirements and mitigation commitments, and the implementation of NPO 59 for the protection of European sites, the NPF is not foreseen to have any adverse effects to the ecological integrity of any European site. Thus, there are no predicted in-combination impacts from the NPF 2040 with the Proposed Scheme.

6.7.2.3 National Investment Framework for Transport in Ireland 2021

The Department of Transport, Tourism and Sport (DTTAS) has developed a successor high-level strategic framework to its Strategic Investment Framework for Land Transport (2015), the National Investment Framework for Transport in Ireland (NIFTI), for prioritising future investment in the land transport network. This is underpinned by and supports the spatial objectives and NSOs outlined in the NPF 2040. The new framework was published in December 2021. The NIFTI recognises the population growth targets outlined in the NPF and also the objectives of the Climate Action Plan. Investment under the NIFTI therefore aims to prioritise transport investment while enabling the delivery of a high-performing transport system. Four Investment Priorities are identified as follows:

- Decarbonisation;
- Protection and Renewal;
- Mobility of People and Goods in Urban Areas; and
- Enhanced Regional and Rural Connectivity.

The 'modal hierarchy' favours active travel, followed by public transport, and then private vehicles. The 'intervention hierarchy' is structured as 'maintain, optimise, improve, new.'

The Proposed Scheme addresses many transport needs in the region and locally in Slane. It improves the balance of the various travel modes and seeks to make alternative modes more attractive to both local residents and visitors, thereby reducing vehicular trips.

The preparation and implementation of NIFTI must meet the provisions of the EU Habitats Directive (92/43/EEC) and transposing regulations (European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011). The conclusion of the NIS for NIFTI is that, following detailed assessment and appropriate mitigation for protecting European sites and their associated species and habitats, there will be no adverse effects on the integrity of any European sites, either alone or in-combination with other plans or projects. Significant individual infrastructure developments arising from the NIFTI will be subject to their own AA requirements and specific mitigation measures will need to be identified and implemented at the project-level AA stage. Furthermore, the Strategic Environmental Assessment (SEA) prepared for the NIFTI outlines the following objective for the protection of biodiversity, flora and fauna:

'Protect and, where appropriate, enhance terrestrial, aquatic and soil biodiversity, particularly EU and national designated sites and protected species, and associated ecological corridors'.

With the incorporation of these AA requirements and mitigation commitments, and the implementation of the objectives for the protection of European sites, the NIFTI is not foreseen to have any adverse effects to the ecological integrity of any European site. Thus, there are no predicted in-combination impacts from the NIFTI with the Proposed Scheme.

6.7.2.4 National Roads 2040

National Roads 2040 (NR2040) is TII's strategy for realising the Project Ireland 2040, while also aligning to the DTTAS 's NIFTI. It was published in draft for consultation in August 2022. TII's vision for the strategy is that it will support the transport system while maintaining innovation, accessibility and safety. The strategy contains thirty commitments across a number of areas such as decarbonisation, urban congestion, technological change, population growth, and safety.

As part of the preparation of NR2040, environment assessments such as Appropriate Assessment (AA) have been undertaken in tandem with the development of the strategy to identify, at a strategic level, potential effects on the environment as a result of the draft strategy commitments/ actions. This assessment ensures the high-level of protection of the environment with a view to promoting sustainable development. The NR2040 recognises that the development and management of transport infrastructure must assess, avoid, reduce and mitigate adverse environmental impacts, including direct and indirect impacts to biodiversity and/or habitats. Significant individual road projects arising from the NR2040 will be subject to their own AA requirements and specific mitigation measures will need to be identified and implemented at the project-level AA stage.

With the incorporation of these AA requirements and mitigation commitments, the NR2040 is not foreseen to have any adverse effects to the ecological integrity of any European site. Thus, there are no predicted in-combination impacts from the NPF 2040 with the Proposed Scheme.

6.7.2.5 National Biodiversity Action Plan 2017-2021

The *National Biodiversity Action Plan for 2017-2021* (DCHG, 2017) demonstrates Ireland's continuing commitment to meeting and acting on its obligations to protect biodiversity for the benefit of through a series of targeted strategies and actions. The action plan will be updated and replaced for the period 2022-2026. Investment under the NDP is being provided to support the objectives of the National Biodiversity Action Plan, and its successor plan, including accelerating measures to conserve and restore peatlands and wetlands, combat the spread of invasive alien species, implement Local Biodiversity Action Plans and invest in agri-environment schemes.

This report and some of the mitigation measures proposed are considered consistent with specific objectives of the plan. For example, this report considers conservation objectives of relevant European sites (objective 6.1.7) in order to ensure the conservation status of sites are met, while mitigation measures include for the protection of watercourses including the River Boyne and its tributaries (Objective 4.2.1) and the control of invasive alien plant species (Objective 4.4.3). Relevant objectives include:

- **Objective 4.2.1**

  "Continue to protect, enhance and monitor the ecological status of water during the second cycle of the Water Framework Directive (2015- 2021) including reducing risks to water quality and utilising ecological expertise in decision-making, and in analysis of cumulative effects."

- **Objective 4.4.3**

  "Continue and enhance measures for eradication, where feasible, control and containment of invasive species."

- **Objective 6.1.7**

  "Implement the conservation measures necessary to achieve the published conservation objectives for Natura 2000 sites. Develop and implement additional measures as necessary to achieve favourable conservation status both nationally and at site level."

As the overall aim of the plan is to protect biodiversity and to continue and improve the transposition of the EU Habitats Directive and the EU Birds Directive into national legislation, there are no predicted in-combination impacts from the National Biodiversity Action Plan 2017-2021 with the Proposed Scheme.

6.7.2.6 Integrated Implementation Plan 2019-2024

The National Transport Authority (NTA)'s *Integrated Implementation Plan 2019-2024* (NTA, 2019) supports the delivery of the Transport Strategy and is aligned with the objectives of the NDP. The preparation of this plan was aligned with the Government's review of capital spending, which commenced in 2016 and culminated with the publication of the former NDP 2018-2027 in February 2018. The Implementation Plan identifies the key investment areas with respect to bus, light rail, heavy rail and integration and sustainable transport investment.

The design, planning, construction and operation of all transport schemes identified within the Implementation Plan will be required to take full account of the natural and built environment, including compliance with the EU Habitats Directive (92/43/EEC). The AA for the Implementation Plan concludes that it is considered that the plan will not have a significant adverse effect on the integrity of the Natura 2000 network of sites. Thus, there are no predicted in-combination impacts from the Integrated Implementation Plan 2019-2024 with the Proposed Scheme.

6.7.2.7 Draft Transport Strategy for the Greater Dublin Area 2022-2024

The *Draft Transport Strategy for the Greater Dublin Area 2022-2042* (herein referred as GDA Draft Transport Strategy) (NTA, 2021) replaces the previous framework titled the *Transport Strategy for the Greater Dublin Area 2016-2035* and has been developed to be consistent with regional policies including the *Regional and Spatial Economic Strategy for Eastern and Midland Region 2019-2031*. The GDA Draft Transport Strategy was published for public consultation from November 2021 to January 2022 and is currently under review.

During the period of the Strategy it is intended that the national road network will be further developed in which the N2 Slane Bypass and associated public realm and sustainable transport enhancements in Slane Village is noted. The GDA Draft Transport Strategy sets out primary objectives with regard to the national road networks as follows:

- **Measure ROAD1** – Principles of Road Development

  "That road schemes, other than a motorway or protected road, will be designed to provide a safe and appropriate arrangements to facilitate walking, cycling and public transport provision, including as applicable, the delivery of walking and cycling facilities off line where this is considered to be a more attractive solution for these modes."

  "That where a road scheme comprises an urban bypass, measures must be proposed and implemented to reallocate road space within the bypassed area to sustainable transport and/ or public realm improvements."

- **Measure ROAD2** – National Roads Requirements

  "Secondary local functions should not be encouraged, or planned for, on national roads in the GDA"

  "National roads are not to be developed or planned, to support the continued urban expansion through the zoning of residential land uses adjacent to or within national road corridors"

- **Measure ROAD3** – National Road Projects

  "It is the intention of the NTA and TII to deliver the national road schemes listed in the Transport Strategy, subject to their appraisal against national and regional policies and objectives."

The GDA Draft Transport Strategy has been subject to SEA and AA, which were carried out in accordance with the strategy objectives set out in the Strategy and the strategic environmental objectives. All recommendations arising from the SEA and AA processes have been integrated into the Strategy and compliance with these measures will facilitate environmental protection and management.

All projects and plans arising from the Strategy will be screened for the need to undertake AA under Article 6 of the Habitats Directive. No projects giving rise to adverse effects on the integrity of European sites (cumulatively, directly or indirectly) shall be permitted on the basis of this Strategy (either individually or in combination with other plans or projects). The proposed N2 Bypass supports connectivity to four European

sites; the River Boyne and River Blackwater SAC, Boyne Coast and Estuary SAC, River Boyne and River Blackwater SPA and Boyne Estuary SPA. This report considers the conservation objectives of these designated sites in order to ensure the conservation status of sites are met, while mitigation measures include for the protection of watercourses including the River Boyne and its tributaries and the control of invasive alien plant species.

The NIS in support of the AA for the GDA Draft Transport Strategy concludes that with the incorporation of mitigation measures that will prioritise the avoidance of effects in the first place and mitigate effects where they cannot be avoided, the Strategy is not foreseen to give rise to any significant adverse effects on the integrity of the Natura 2000 network, alone or in combination with other plans or projects. Thus, the in-combination impacts from the Draft Transport Strategy for the Greater Dublin Area 2022-2024 with the Proposed Scheme are not predicted.

6.7.2.8 Meath County Development Plan 2021-2027

The *Meath County Development Plan 2021-2027* (MCC, 2021) came into effect on 3rd November 2021 and sets out an overall strategy for the proper planning and sustainable development of County Meath over a six-year period. The Development Plan sets out guiding principles in relation to physical growth and renewal, economic, social and cultural activity, and environment protection and enhancement. The Development Plan sets out a vision to identify, protect, conserve and manage the cultural and natural heritage of the County and to encourage its sensitive integration into the sustainable development of the County for the benefit of present and future generations.

The Development Plan notes that *"The protection and wise use of the county's natural resources is vital to achieving sustainable development."* It then sets out a number of policy objectives to ensure the protection of biodiversity in the County. Specific policies are included to protect Natura 2000 sites (SPAs and SACs) in addition to Natural Heritage Areas (NHAs) notably:

- **HER POL 27**

  "To protect, conserve and enhance the County's biodiversity where appropriate."

- **HER POL 31**

  "To ensure that the ecological impact of all development proposals on habitats and species are appropriately assessed by suitably qualified professional(s) in accordance with best practice guidelines – e.g. the preparation of an Ecological Impact Assessment (EcIA), Screening Statement for Appropriate Assessment, Environmental Impact Assessment, Natura Impact Statement (NIS), species surveys etc. (as appropriate)."

- **HER POL 32**

  "To permit development on or adjacent to designated Special Areas of Conservation, Special Protection Areas, Natural Heritage Areas, Statutory Nature Reserves or those proposed to be designated over the period of the Plan, only where the development has been subject to the outcome of the Appropriate Assessment process and has been carried out to the satisfaction of the Planning Authority, in consultation with National Parks and Wildlife."

- **HER OBJ 34**

  "To protect and conserve the conservation value of candidate Special Areas of Conservation, Special Protection Areas, Natural Heritage Areas and proposed Natural Heritage Areas as identified by the Minister for the Department of Culture, Heritage and the Gaeltacht and any other sites that may be proposed for designation during the lifetime of this Plan in accordance with the provisions of the Habitats and Birds Directives and to permit development in or affecting same only in accordance with the provisions of those Directives as transposed into Irish Law."

- **HER OBJ 35**

  "To ensure that development does not have a significant adverse impact, incapable of satisfactory avoidance or mitigation, on plant, animal or bird species protected by law."

  The Development Plan also states that the *"national road network is critically important for national inter-urban traffic in order to provide ready access to ports, airports and other strategic locations."* It then continues to set out a number of policy objectives with regard to national roads and specifically the N2 Slane Bypass project, including:

- **MOV OBJ 44**

  "To support essential public road infrastructure including, bypasses of local towns and villages and proposed national road schemes and where necessary reserve the corridors of any such proposed routes free of development, which would interfere with the provision of such proposals. Such road schemes include those specified in the non-exhaustive list in Table 5.1. Each of these projects will subject to the outcome of the Appropriate Assessment process."

The "N2 Slane Bypass" is listed in Table 5.1 of the Development Plan where it is described *"to deliver key strategic infrastructure including Slane Bypass incorporating new bridge over the River Boyne."*

Chapter 5 of the Development Plan sets out the Movement Strategy for the County which aims to provide for the maintenance and delivery of an efficient, integrated and coherent transport network in line with national and regional policies. The Development Plan provides an overview of the Slane Bypass project and is recognised as a Development of National and Regional Strategic Importance. It is an objective of the Council to:

- **MOV OBJ 36**

  "To support and facilitate the delivery of an N2 Bypass east of Slane Village, which is considered to comprise essential infrastructural development and to construct same subject to obtaining the relevant development consents required and to reservice and protect route option corridors from development which would interfere with the provision of the project. Development of the project will be subject to the outcome of the Appropriate Assessment Process."

Slane has a unique landscape located beside the Hill of Slane, mature woodlands and the Boyne Valley. With regard to the design and public realm within Slane village there are a number of objectives in the Development Plan including:

- **SLN OBJ 19**

  "To introduce consistent village branding/ presentation at the village entry points and along main streets in form of high quality signage, tourism information, public art and consistent village type lighting standards which would strengthen Slane's Identify."

The Proposed Scheme public realm works will not interfere with the design objectives of the Development Plan. The proposals will enhance the village creating new pedestrian crossings, planting to create a village square, improved accessibility for pedestrians and cyclists, upgrades to on-street and off street parking, a new pedestrian/ cycle facility with an access point to the proposed *Boyne Greenway Restoration Scheme*, and other associated works.

Due to the strategic nature of plans and the inclusion of policy objectives for protection of European sites and protected species within the Meath County Development Plan 2021-2027, in-combination impacts with the Proposed Scheme are not predicted.

6.7.2.9 Louth County Development Plan 2021-2027

The *Louth County Development Plan 2021-2027* (Development Plan) came into effect on 11th November 2021. The Development Plan sets out Louth County Council (LCC)'s overall strategy for the proper planning and sustainable development of County Louth over a six-year period. It sets out policies and objectives over a range of issues including, but not limited to; settlement, sustainable communities, movement and transport, heritage and climate action. The Development Plan sets out a number of strategic policy objectives for the protection of the environment and specifically European sites, including:

- **NBG 3**

  "To protect and conserve Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) designated under the EU Habitats and Birds Directives."

- **NBG 4**

  "To ensure that all proposed developments comply with the requirements set out in the DECLG 'Appropriate Assessment of Plans and Projects in Ireland – Guidance for Planning Authorities 2010'."

- **NBG 5**

  "To ensure that no plan, programme, or project giving rise to significant cumulative, direct, indirect or secondary impacts on European sites arising from their size or scale, land take, proximity, resource requirements, emissions (disposal to land, water or air), transportation requirements, duration of construction, operation, decommissioning or from any other effects shall be permitted on the basis of this Plan, either individually or in combination with other plans, programmes or projects."

- **NBG 6**

  "To ensure a screening for Appropriate Assessment (AA) on all plans and/or projects and/or Stage 2 Appropriate Assessment (Natura Impact Report/ Natura Impact Assessment) where appropriate, is undertaken to make a determination. European Sites located outside of the County but within 15 km of the proposed development site shall be included in such screenings as should those to which there are pathways, for example, hydrological links for potential effects."

- **NGB 10**

  "To ensure that development proposals, where relevant, improve the ecological coherence of the Natura 2000 Network of European Sites and encourage the retention and management of landscape features as per Article 10 of the Habitats Directive."

The Louth CDP contains numerous policies designed to ensure the protection of biodiversity in the county. It also ensures that any proposals as part of this plan will, be subject to their own AA requirements. Thus, the in-combination impacts from the Louth County Development Plan 2021-2027 with the Proposed Scheme are not predicted.

6.7.2.10 County Meath Local Biodiversity Action Plan 2015-2020

The *County Meath Biodiversity Action Plan 2015-2020* (MCC, 2015) is the second adopted local biodiversity action plan (LBAP) for the county. The updated plan was published after the National Biodiversity Plan 2011-2016 set out the requirement for a review of existing LBAPS. The County Meath LBAP provides a framework and series of actions to conserve, enhance and raise awareness of the county's rich biodiversity. It aims to maximise the contribution that it makes to the social, economic and environmental wellbeing of the county, taking into account local, national and international, including European priorities.

The County Meath LBAP sets out objectives and accompanying actions to conserve and create awareness about Meath's biodiversity, which all contribute towards the protection of European sites and the species and habitats for which they are designated. As the overall aim of the Meath LBAP is to protect the natural environment and prevent biodiversity loss, in-combination impacts from the County Meath Biodiversity Action Plan 2015-2020 with the Proposed Scheme are not predicted.

6.7.2.11 Louth Biodiversity Action Plan 2021-2026

The *Louth Biodiversity Action Plan 2021-2026* (LCC, 2021) was published by LCC in January 2021. It is intended to translate the policies and implement the actions set out in the EU Biodiversity Strategy for 2030 (EC, 2020) and the National Biodiversity Action Plan, to a local level within the county. The purpose of the Louth LBAP is to protect, enhance and restore the natural environment within County Louth and contribute to national and international efforts to halt biodiversity loss.

Ireland's current strategy is the National Biodiversity Action Plan 2017–2021. This will be replaced during the lifetime of the Louth LBAP, which will be reviewed to order to ensure its alignment with the new national plan. The LBAP sets out a number of policy objectives and actions relevant to the conservation and restoration of biodiversity and improving the management of protected areas and species within County Louth, including:

- **Objective 6 – Action 31**

"Louth County Council will implement the conservation measures necessary to achieve the published conservation objectives for Natura 2000 sites, including those sites which might be designated in future. Develop and implement additional measures as necessary to achieve favourable conservation status both nationally and at site level (NBAP action 6.1.7)."

As the overall aim of the Louth LBAP is to protect the natural environment and prevent biodiversity loss, no in-combination impacts from the Louth Biodiversity Action Plan 2021-2026 with the Proposed Scheme are predicted.

6.7.2.12 2nd Cycle River Basin Management Plan

The Water Framework Directive (WFD) provides a framework for the protection and improvement of rivers, lakes, marine and groundwaters in addition to water-dependent habitats. The aim of the WFD is to prevent any deterioration in the existing status of water quality, including the protection of good and high-water quality status where it exists. The second cycle River Basin Management Plan (RBMP), covering the period 2018 – 2021, sets out a proposed framework for the protection and improvement of Ireland's water environment in line with WFD objectives. The draft third RBMP for Ireland, covering the period 2022-2027, underwent public consultation in 2022 and is being finalised. The objectives of the RBMP are to:

- Prevent deterioration;
- Restore good status;
- Reduce chemical pollution; and
- Achieve water related protected areas objectives.

There are binding obligations on all Irish local authorities, including Meath County Council, to achieve good status of surface waters, under the terms of the EU Water Framework Directive 2000/60/EC. The implementation of the RBMP seeks compliance with the environmental objectives set under the plan, which will be documented for each water body. This includes compliance with the European Communities (Surface Waters) Regulations S.I. No. 272 of 2009 (as amended). The implementation of the RBMP and achievement or maintenance of environmental objectives which will be set for the receiving water bodies will have a positive impact on water dependent habitats and species within European sites.

As the overall aim of the RBMP is to protect and improve Ireland's water environment in line with WFD objectives, no negative in-combination impacts with the Proposed Scheme are predicted.

6.7.3 Projects

A search was conducted of planning / consent applications (projects) using the My Plan map viewer (MyPlan, 2021), Meath County Council planning search (MCC, 2021[38]) and Louth County Council planning search (LCC, 2021[39]). The search was limited to the five-year period preceding the date of issue of this report and excluded retention applications incomplete, withdrawn, and refused applications.

Furthermore, a search of An Bord Pleanála's website (ABP, 2021) was completed to identify any relevant applications, including Strategic Infrastructure Development (SID) and Strategic Housing Development (SHD) in the past five years or in close proximity to the Proposed Scheme. A five-year timeframe is deemed the most appropriate period for the planning search. Permissions granted more than five years ago would generally be constructed, partially constructed, or are under construction when the planning site is viewed.

Several applications are noted in the vicinity relating to single rural dwellings, agricultural sheds, slatted units and sewage treatment units. Key applications are displayed in **Table 6-6** and their potential for in-combination impacts with the Proposed Scheme discussed.

[38] Meath County Council Planning Applications. Available online at: https://www.eplanning.ie/MeathCC/SearchTypes

[39] Louth County Council Planning Applications. Available online at: https://www.eplanning.ie/LouthCC/SearchTypes

Table 6-6: Relevant Planning / Consent Application Search Results

Planning App. Reference Number (Planning Authority)	Project/ Applicant Name and Proposed Location	Brief Description	Application Status/ Outcome	Distance from Proposed scheme	Date Planning App. Granted	Potential for In-combination effects?
Projects						
LB180519 (MCC)	Cheverdale Ltd. Ledwidge Hall Green, Drogheda Road, Slane, Co. Meath.	Construction of 16 no. two story 3 bedroom semi-detached dwellings in lieu of 11 no. 4 bedroom two story detached dwellings approved under planning permission LB/160659.	Permitted (Conditional)	0.34 km from Proposed Scheme	15/11/2018	AA Stage 2 was not required on the basis of the screening. No in-combination effects are deemed likely.
21424 (MCC)	Dawn Meats, Painestown, Seneschalstown, Dollardstown, Hayestown-Carnuff Little & Ardmulchan, Navan, Co. Meath.	Construction of an extension to an existing wastewater treatment plant (WWTP) where the works include; Demolition works, construction of new single-storey industrial type building, installation of new sludge press, change/install aeration tanks, alteration to perimeter berm to increase footprint of WWTP and move treated wastewater rising main from site of the proposed development to new discharge point at the River Boyne (distance 7.2 km).	New Application	2.31 km southwest	–	EIAR and NIS prepared. It is not anticipated that this project would impact negatively upon the Natura 2000 network during the operational phases of the project. Where mitigation measures are outlined and undertaken, no in-combination effects are deemed likely.
LB190883 (MCC)	Lorrac Developments, Ledwidge Hall, Drogheda Road, Slane, Co. Meath.	Demolition of a derelict dwelling and surrounding derelict outbuildings together with permission for the construction of 36 No. houses.	Permitted (Conditional)	0.32 km from Proposed Scheme	11/03/2020	AA Stage 2 was not required on the basis of the screening. The distance between the development and the River Boyne and Blackwater SAC/SPA is adequate to predict that there will be no impacts upon these designated areas, as there are no direct source-pathway-receptor linkages between the two areas. No in-combination effects are deemed likely to occur.
LB200063 (MCC)	Irish Water, Slane Wastewater Treatment Plant, Castle Hill, Navan Road, Slane, Co. Meath.	Development will provide for the upgrade of the Slane WWTP and will generally comprise the following: construction of a storm water holding tank compete with cleaning system and access stairs; construction of a final effluent wash-water pumping station; and all ancillary site development works including hard and soft landscaping.	Permitted (Conditional)	0.71 km from the Proposed Scheme	19/06/2020	AA Stage 2 was not required on the basis of the screening. Due to the nature, scale and works associated with an existing WWTP no significant effects are likely to occur. As the project will not significantly affect any European site, no in-combination effects are deemed likely.
LB180300 (MCC)	Dunbia, Painestown, Beauparc, Navan, Co. Meath.	Construction of extension to existing WWTP.	Permitted (Conditional)	2.33 km southwest	10/07/2018	AA Stage 2 was carried out for this project. The project includes for discharge into the River Boyne with potential impacts on the River Boyne and River Blackwater SAC and the River Boyne and River Blackwater SPA. An assimilative capacity assessment was

Planning App. Reference Number (Planning Authority)	Project/ Applicant Name and Proposed Location	Brief Description	Application Status/ Outcome	Distance from Proposed scheme	Date Planning App. Granted	Potential for In-combination effects?
						undertaken and concluded that where mitigation is undertaken, no in-combination effects with the Proposed Scheme are deemed likely.
21439 (MCC)	Hibernia Steel Products Ltd, Grangeeth, Slane, Co. Meath.	Development will consist of the installation of 287 solar panels (106.19 kWp) on a 725 sq.m roof Section of an existing building and all associated works.	Permitted (Conditional)	4.09 km north	10/06/2021	AA Stage 2 was not required on the basis of the screening. Where there is no pathway for significant effect no in-combination effects will occur.
LB170187 (MCC)	Land and Heritage Properties Holdings Ltd., Conyngham Arms Hotel, Main Street, Slane, Co. Meath.	Development will consist of the refurbishment of existing Protected Structures to provide an additional nineteen bedrooms and reception facilities to the existing Conyngham Arms Hotel.	Permitted (Conditional)	0.47 km from the Proposed Scheme	01/11/2017	AA screening conclusion states that the proposed development would not be likely to have a significant effect on European sites. AA Stage 2 was not required on the basis. Where there is no pathway for significant effect, no in-combination effects are deemed likely.
LB170509 (MCC)	JBM Solar Developments Ltd., Grangeeth, Slane, Co. Meath.	Ten year permission to develop a Solar Farm. The development will consist of the installation of a photovoltaic (PV) solar panel array consisting of up to 11 ha of solar panels.	Permitted (Conditional)	4.22 km north	16/03/2018	AA Screening revealed that due to the nature of the project and geographical separation between the proposed solar farm site and Natura 2000 sites, it is not considered likely to give rise to any impacts on European sites. Where there is no pathway for significant effect, no in-combination effects are deemed likely.
Strategic Housing Developments						
311678 (LCC)	Loughdale Properties Ltd, Old Slane Road, Mell/Tullyallen, Drogheda, Co. Louth.	237 no. residential units (86 no. houses, 151 no. apartments), creche and associated site works.	Permitted (Conditional)	>10 km east	09/02/2022	NIS submitted. There is hydrological connectivity between this project and the River Boyne and River Blackwater SAC, the River Boyne and River Blackwater SPA. the Boyne Estuary SPA and the Boyne Coast and Estuary SAC. Potential was also identified on kingfisher and supporting habitat to SCI birds. The NIS concluded that where mitigation measures are outlined and undertaken, the proposed development will not result in any adverse impact on the integrity or QI/SCI of any relevant European site. Therefore, no in-combination effects are deemed likely.
313083 (LCC)	The Ardee Partnership,	272 no. residential units (206 no. houses, 66 no. apartments), creche and associated site works.	Lodged	> 10 km east	n/a	AA Screening Report and NIS submitted. Given the nature and location of this

Planning App. Reference Number (Planning Authority)	Project/ Applicant Name and Proposed Location	Brief Description	Application Status/ Outcome	Distance from Proposed scheme	Date Planning App. Granted	Potential for In-combination effects?
	Bridgegate, Rathgory and Mulladrillen, Drogheda Road, Ardee, Co. Louth.					development, it is not predicted to give rise to any impacts on any European sites. In addition, this development does not support any connectivity with the European sites considered in this NIS. No in-combination effects will occur.
309668 (LCC)	Hallscotch Venture Ltd, Land adjacent to Scotch Hall Shopping Centre, Marsh Road, Drogheda, Co. Louth.	275 no. apartments, creche and associated site works.	Permitted (Conditional)	> 10 km east	29/06/2021	AA Stage 2 was carried out for this project, with regards to the River Boyne and River Blackwater SAC and the Boyne Coast and Estuary SAC.
303799 (MCC)	Coreet Ltd., Bryanstown, Drogheda, Co. Meath.	250 no. dwelling units (94 no. houses, 156 no. duplex/apartments), creche and associated site works.	Permitted (Conditional)	> 10 km east	10/06/2019	AA screening concluded that AA Stage 2 was not required. There is hydrological connectivity between this project and the River Boyne and River Blackwater SAC and the Boyne Estuary SPA. However, no LSEs were predicted on these sites with regard to their qualifying features. Given the lack of predicted impacts and the intervening distance between this project and the Proposed Scheme, no in-combination effects are deemed likely.
Strategic Infrastructure Developments						
308628 (MCC)	CAP Developments LLC, Drogheda IDA Business and Technology Park, Donore Road, Drogheda, Co. Meath.	110 kV gas insulated switchgear substation compound, associated dropdown transmission lines and associated development.	Permitted (Conditional)	> 10 km east	28/04/2021	AA screening concluded it is not likely that the project will have a significant effect on European sites. Stage 2 AA was therefore not required. Given the nature and location of this development, it is not predicted to give rise to any impacts on any European sites. In addition, this development does not support any connectivity with the European sites considered in this NIS. Therefore, no in-combination effects with the Proposed Scheme will occur.
PA0050 (MCC)	Irish Cement Ltd., Platin Cement Works, Platin, Duleek Co. Meath.	10 year permission to facilitate further replacement of fossil fuels with alternative fuels and allow for the introduction of alternative raw materials in the manufacturing of cement at Platin Cement Works	Permitted (Conditional)	8.5 km west	11/04/2018	AA Screening determined that AA Stage 2 was required. The NIS concluded that the proposed development will not result in any impact on the integrity or QI/SCI of any relevant European site. The potential impacts predicted to arise from this project are

Planning App. Reference Number (Planning Authority)	Project/ Applicant Name and Proposed Location	Brief Description	Application Status/ Outcome	Distance from Proposed scheme	Date Planning App. Granted	Potential for In-combination effects?
						contamination of surface waters and emissions to air. There is no potential for in-combination effects with the Proposed Scheme on surface waters, as this project does not support hydrological connectivity to any of the European sites assessed in this NIS. In relation to emissions to air, the development will result in a number of positive indirect effects on air quality due to the use of alternative fuels and alternative raw materials. Cumulative impacts resulting from emissions to air are not predicted. Therefore, no in-combination effects with the Proposed Scheme will occur.

6.7.4 In-combination Conclusion

Adherence to the overarching policies and objectives of the Meath County Development Plan 2021-2027 and any future development plans ensure that local planning applications and subsequent grant of planning comply with the core strategy of proper planning and sustainability and with the requirements of relevant EU Directives, National Legislation and environmental considerations, other projects and plans are not predicted to have adverse effects on the integrity of any European sites, either alone or in-combination.

Having regard for the legal protection of European sites (through legislation at national level, and policy initiatives at national, county and local levels), no significant in-combination effects are predicted to affect the River Boyne and River Blackwater SAC, Boyne Coast and Estuary SAC, River Boyne and River Blackwater SPA and Boyne Estuary SPA.

6.8 Summary of Assessment

Table 6-7: Impact Assessment Summary

Qualifying Interest	Construction phase impact(s)	Operational phase impact(s)	Are mitigation measures required?	Cumulative Impacts
River Boyne and River Blackwater SAC				
*Alluvial forests with Alnus glutinosa and Fraxinus excelsior (*Alno-Padion, Alnion incanae, Salicion albae*) [91E0]	Water quality (sediment and pollutants)	Water quality (sediment and pollutants)	**Yes.** **Construction/Operational phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses. • Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	None identified
	Habitat loss	Habitat loss	**Yes.** **Construction/Operational phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses. • Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	
	Changes in hydrological regime	Changes in hydrological regime	No.	
River Lamprey *Lampetra fluviatilis* [1099] Salmon *Salmo salar* [1106]	Water quality (sediment and pollutants)	Water quality (sediment and pollutants)	**Yes.** **Construction/Operational phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses. • Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	
	Air pollution (dust)	None.	**Yes.** **Construction phase**	

Qualifying Interest	Construction phase impact(s)	Operational phase impact(s)	Are mitigation measures required?	Cumulative Impacts
			• Measures required to control the impact of dust on surrounding sensitive habitats (i.e. watercourses). • Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	
	Disturbance (noise emissions, artificial lighting)	Disturbance (artificial lighting)	**Yes.** **Construction phase** • Measures required to control artificial lighting associated with construction.	
	Habitat loss	Habitat loss	**Yes.** **Construction/Operational phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses. • Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	
Otter *Lutra lutra* [1355]	Water quality (sedimentation and pollution)	Water quality (sedimentation and pollution)	**Yes.** **Construction/Operational phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses. • Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	None identified
	Habitat loss	Habitat loss	**Yes.** **Construction phase only** • Measures required to re-instate habitat temporarily lost within the footprint of the River Boyne and River Blackwater SAC. • Measures required to identify any new territories, breeding or couching sites by carrying out pre-construction surveys.	

Qualifying Interest	Construction phase impact(s)	Operational phase impact(s)	Are mitigation measures required?	Cumulative Impacts
	Disturbance (noise emissions, artificial lighting and human disturbance)	Disturbance (artificial lighting)	**Yes.** **Construction phase** • Measures required to control noise and artificial lighting associated with construction. • Measures required to identify any new territories, breeding or couching sites by carrying out pre-construction surveys. **Operational phase** • • Measures to prevent direct mortality of otter i.e. mammal fencing. • Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	
	Prey availability	Prey availability	**Yes.** **Construction/Operational phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses. • Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	
Boyne Coast and Estuary SAC				
Estuaries [1130] Mudflats and sandflats not covered by seawater at low tide [1140]	Water quality (sedimentation and pollution)	Water quality (sedimentation and pollution)	**Yes.** **Construction/Operational phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses. • Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	None identified
	Habitat loss/deterioration	Habitat loss/deterioration	**Yes.** **Construction phase only**	

Qualifying Interest	Construction phase impact(s)	Operational phase impact(s)	Are mitigation measures required?	Cumulative Impacts
			• Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses. • Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	
Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) [1330] *Salicornia* and other annuals colonizing mud and sand [1310] Mediterranean salt meadows (*Juncetalia maritimi*) [1410]	Water quality (sedimentation and pollution)	Water quality (sedimentation and pollution)	**Yes.** **Construction/Operational phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses. • Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	
	Habitat loss/deterioration	Habitat loss/deterioration	**Yes.** **Construction phase only** • See water quality mitigation for estuaries, and mudflats and sandflats. • Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	
	None.	Changes to hydrological regime	No.	
River Boyne and River Blackwater SPA				
Kingfisher *Alcedo atthis* [A229]	Air pollution (dust)	None.	**Yes.** **Construction phase only** • Measures required to control the impact of dust on surrounding sensitive habitats (i.e. watercourses).	None identified
	Prey loss	Prey loss	**Yes.** **Construction phase** • See air pollution and water quality mitigations for kingfisher. **Operational phase**	

Qualifying Interest	Construction phase impact(s)	Operational phase impact(s)	Are mitigation measures required?	Cumulative Impacts
			• Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	
	Water quality (sedimentation and pollution)	Water quality (sedimentation and pollution)	**Yes.** **Construction phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses. **Operational phase** • Measures to ensure drainage features function effectively and are subject to regular inspection and maintenance.	
	Disturbance (bridge, noise/vibration emissions, artificial lighting and human presence)	Disturbance (bridge, noise/vibration emissions, artificial lighting and human presence)	**Yes.** **Construction phase only** • Pre-construction surveys.	
	Habitat loss/deterioration	None.	**Yes.** **Construction phase only** • See air pollution and water quality mitigations for kingfisher. • Pre-construction surveys.	
Boyne Estuary SPA				
Lapwing *Vanellus vanellus* Golden Plover *Pluvialis apricaria*	Disturbance (presence of bridge, noise/vibration emissions, human presence and artificial lighting)	Disturbance (presence of bridge, artificial lighting)	**Yes.** **Construction/Operational phase** • Measures required to control light spill associated with artificial lighting.	None identified
	Habitat loss	None.	No.	
	None.	Collision risk	No.	
Shelduck *Tadorna tadorna* Oystercatcher *Haematopus ostralegus* Grey Plover *Pluvialis squatarola*	Water quality (sedimentation and pollution)	Water quality (sedimentation and pollution)	**Yes.** **Construction/Operational phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses.	

Qualifying Interest	Construction phase impact(s)	Operational phase impact(s)	Are mitigation measures required?	Cumulative Impacts
Knot *Calidris canutus* Sanderling *Calidris alba* Black-tailed Godwit *Limosa limosa* Redshank *Tringa tetanus* Turnstone *Arenaria interpres* Little Tern *Sterna albifrons*	Habitat loss	Habitat loss	**Yes.** **Construction/Operational phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses.	
	Prey loss	Prey loss	**Yes.** **Construction/Operational phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses.	
Wetlands	Water quality (sedimentation and pollution)	Water quality (sedimentation and pollution)	**Yes.** **Construction/Operational phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses.	
	Habitat loss	Habitat loss	**Yes.** **Construction/Operational phase** • Measures required to maintain water quality and control sedimentation and pollutants in receiving watercourses.	

7 MITIGATION

The term "mitigation measures" are considered to be "*measures that aim to minimise, or even cancel, the negative impacts likely to arise when a plan or project is implemented so that the site's integrity is not adversely affected. These measures are considered in the context of Article 6(3) and are an integral part of the specifications of a plan or project or conditional to its authorisation"* (EC, 2021). A number of mitigation measures are required to mitigate the likely effects of the Proposed Scheme during pre-construction, construction and operation, which are outlined in **Section 7.2, 7.3** and **7.4**, respectively.

Section 7.1 outlines a number of measures that have been incorporated and integrated into the design of the Proposed Scheme, which contribute to reducing the potential for significant environmental effects. These designed-in measures were not taken into account in the Stage 1 screening for AA in accordance with guidance and prevailing case law at the time the screening was undertaken, but can lawfully be taken into account for the Stage 2 appraisal. As there is a commitment to implementing these measures, they are considered inherently part of the design of the Proposed Scheme and not mitigation for the purpose of mitigating any impact on European site(s). These measures are considered standard industry practice for this type of development.

7.1 Measures Incorporated into the Design

The following measures have been incorporated and integrated into the Proposed Scheme design as described in **Chapter 4** and **Chapter 5**. The key measures are:

- A clear-span weathering steel plate girder bridge will be used in order to eliminate the requirement for any instream works, to eliminate direct ecological impact on the freshwater environment of the River Boyne and River Blackwater SAC and to minimise any barrier effect to certain species during the operation of the Proposed Scheme.
- Working platforms will consist of reno-mattresses containing washed clean rockfill in order to prevent the introduction of any additional run-off in the form of sediment, particularly working platforms 3 and 4 located within the floodplain of the River Boyne and River Blackwater SAC (for details, refer to **Chapter 5 – Description of the Construction Strategy**, and **Appendix 5.1 – Working Platform Design**).
- To facilitate the construction of bridge piers within the floodplain of the River Boyne and River Blackwater SAC, cofferdams will be constructed which will comprise of interlocking sheetpiles. Cofferdams will provide an almost watertight environment, preventing any uncontrolled run-off during construction from reaching the River Boyne. Rainwater will enter the cofferdam at times and some groundwater may also ingress from the base of the cofferdam, both of which will be pumped out using a bowser and taken off-site to a suitably licensed facility for treatment/ disposal.
- Nurse seeding and planting, and geotextiles and mats will be employed during the construction phase on all exposed earthworks slopes to limit the amount of sediment in rainfall or groundwater run-off.
- Settlement ponds, check-dams and silt barriers will be installed during the construction phase to reduce sediment that has become suspended despite the erosion controls.
- To minimise sediment run-off from stockpiles their locations have been carefully considered. Stockpiles will be:
  - Located away from drains, water bodies and flood zones;
  - Nurse seeded or provided with other surface protection appropriate to the length of time the stockpile is in place;
  - Provided with earth bunds or ditches on adjacent higher ground or slopes to prevent surface run-off reaching the stockpile;
  - Provided with silt fences around the toe of a stockpile to trap any sediment in run-off from the stockpile; and
  - Topsoil stockpiles will be tamped down and grass-seeded and protected by a surrounding silt fence.
- Where groundwater is encountered, slope drains and external de-watering will be utilised.

- The drainage design for the Proposed Scheme includes for measures to both mitigate any interference with the existing hydrology and to convey run-off from the proposed road scheme to proposed treatment and attenuation facilities prior to outfall to existing watercourse.
- To assist with the proposed treatment of surface water run-off and to provide measures to reduce peak water flows to outfalls, six attenuation ponds together with vortex grit separators and petrol interceptors will be provided.
- Control measures will be implemented to reduce the generation of airborne material (i.e. dust), including:
  - Use of water spraying of exposed earthworks and site haul roads during dry weather. Sediment tracked on plant will be controlled at exit from the site (i.e. wheel washes).
  - Spraying of earthworks during dry weather conditions will include for the provision of silt traps;
  - Self-contained wheel washes will be provided at site compounds as well as at site exit points;
  - Erosion control measures will be implemented as early as possible to protect exposed side slopes (i.e. erosion control mats and hydroseeding);
  - Site vehicle speeds will be limited to minimise the dust re-suspension;
  - Hard surface roads will be regularly swept; and
  - Dust generation will be monitored as part of the management of construction activities. Dust monitoring locations will be established on site. A baseline dust measurement will be made in advance of works and an ongoing system of monitoring and remedial action will be implemented during the construction.
- Measures will be implemented to maintain a clean and uncluttered site, including:
  - Daily inspections of the site will be carried out and a program of site tidying will be prepared;
  - Debris netting will be attached to scaffolding to prevent debris materials and equipment from falling from a height as both a debris matter and for health and safety reasons;
  - Food waste will be strictly controlled to prevent litter and/or attraction of vermin;
  - Wheel wash facilities will be provided for vehicles exiting the construction site. Wheel wash run off will be stored in an onsite storage tank and will be disposed of by permitted waste haulage company at a permitted or licensed facility;
  - There will be regular inspection and sweeping of public roads; and
  - Covering will be applied to loaded lorries and skips, if necessary.
- A Resource and Waste Management Plan (RWMP) will be prepared by the contractor in advance of construction to ensure that the materials and waste arising during the construction and demolition phase of the Proposed Scheme will be managed and disposed of in a way that ensures compliance with the provisions of the Waste Management Act, 1996, as amended and associated Regulations as amended. The preparation of the RWMP will follow the EPA guidance (Best Practice Guidelines for the preparation of resource & waste management plans for construction & demolition projects, EPA 2021.
- Earthworks will be phased into Phase 1 (Drainage) and Phase 2 (Earthworks):
  - Phase 1 will include the construction and nurse seeding of all permanent pre-earthworks ditches (PEDs) and attenuation ponds and the construction of all culverts as this will allow sufficient time for vegetation establishment on the base and sides of the ponds prior to the commencement of the main earthworks and will allow the permanent attenuation ponds to be utilised as temporary settlement ponds for the treatment of construction run-off; and
  - Phase 2 will include earthworks of the proposed mainline and side roads which have been divided into zones based on existing and proposed topography, and existing and proposed road layouts. The construction of the zones will be carried out in the sequence set out below to reduce the risk of sediment-laden run-off entering the River Boyne and River Blackwater SAC and SPA directly or indirectly.
- Machines will be checked regularly for evidence of hydrocarbon leaks. While machines are parked-up on the working platform, a contaminant containment tray will be placed beneath them. These trays will

be removed from the working platform at the end of each day and any contaminants they have collected disposed of accordingly. An early warning system will be implemented to monitor rainfall and upstream river levels in real-time. Once set thresholds are exceeded all materials, plant and equipment will be removed from the platform.

7.2 Pre-construction Works

7.2.1 Appointment of Environmental Team

Prior to commencement of any works related to the Proposed Scheme, the following key environmental personnel shall be appointed (see **Chapter 5 – Description of the Construction Phase**):

- **Contractor's Environmental Clerk of Works (ECoW):** to ensure that the mitigation measures outlined in this document and the outline Environmental Operating Plan (EOP) (including any updates to these documents following consent) are implemented in full and to supervise works with respect to sensitive habitats and/or species (including the control/eradication of invasive species).
- **Contractor's Project Ecologist(s):** to supervise all pre-construction ecological surveying, implementation and overseeing of ecological mitigation measures and ensuring that activities on site are conducted in accordance with the planning permission as they pertain to ecological matters and specifically any works that could have an effect on the River Boyne and River Blackwater SAC and/or SPA, their qualifying interests (QI) and special conservation interests (SCI) respectively.
- **Client Environmental Representative (CER):** MCC shall appoint the CER before the commencement of works. The CER shall act as the '*MCC representative*' and liaise directly with the contactor's environmental staff, review reporting deliverables, and supervise site activities as required.
- **Client Project Ecologist:** MCC shall appoint the Client Project Ecologist before the commencement of works. to supervise all pre-construction ecological surveying, implementation and overseeing of ecological mitigation measures and ensuring that activities on site are conducted in accordance with the planning permission as they pertain to ecological matters and specifically any works that could have an effect on the River Boyne and River Blackwater SAC and/or SPA, their qualifying interests (QI) and special conservation interests (SCI) respectively.

Note: When mitigation measures extend beyond the construction phase (undertaken by Contractor), and thereafter require 'monitoring' during the operational phase, Meath County Council will be responsible for the commission of a suitably qualified person(s) to monitor their effectiveness.

7.2.2 Pre-construction Ecological Surveys

Prior to commencement of any works, the following pre-construction surveys will be completed by a qualified person(s):

- **Otter surveys:** evidence of otter was recorded along the River Boyne, the Boyne Canal and the Mattock (Mooretown) stream. No breeding or resting sites were recorded within the ZoI of the Proposed Scheme. However, prior to any works being carried out, a pre-construction otter survey will be carried out to ensure that otter has not taken up residence or established any new territories within or in close vicinity to the footprint of the Proposed Scheme. The survey will be completed within the footprint of the proposed scheme and 200m up and downstream of this footprint. The survey will confirm the presence/absence of otter holts, resting sites (couches) and any other signs of otter activity within the survey area. The survey will be completed with reference to Guidelines for the Treatment of Otter Prior to the Construction of National Road Schemes (NRA, 2006b) or whatever guidelines are pertinent at that stage in the event that those guidelines are updated and superseded. The survey will be completed during optimal seasonal/weather conditions and will be completed by competent, experienced otter surveyor(s). The findings of the pre-construction survey will be reviewed with respect to the Proposed Scheme in relation to whether the updated findings trigger a requirement for a species derogation licence from NPWS; based on current baseline no such derogation licensing is necessary.
- **Kingfisher surveys:** evidence of kingfisher was recorded along the River Boyne. One nesting site was recorded upstream of the Proposed Scheme, however no adverse effects were predicted. Although no suitable nesting habitat was noted within the footprint of the Proposed Scheme, the precautionary principle has been applied and prior to any works being carried out, a pre-construction kingfisher survey

will be carried out to ensure that kingfisher has not established any new territories within or in close vicinity to the footprint of the Proposed Scheme. The survey will be completed within the footprint of the proposed scheme and 200m up and downstream of this footprint. The survey will confirm the presence/absence of kingfisher nesting sites and any other signs of kingfisher activity within the survey area. The survey will be completed during optimal seasonal/weather conditions and will be completed by competent, experienced ornithologist(s). The findings of the pre-construction survey will be reviewed with respect to the Proposed Scheme in relation to whether the updated findings trigger a requirement for a species derogation licence from NPWS; based on current baseline no such derogation licensing is necessary.

- **Invasive Alien Plant Species survey:** the presence of Japanese Knotweed *Reynoutria japonica* and Himalayan Balsam *Impatiens glandulifera* have been identified in the vicinity of the Proposed Scheme. The survey will be undertaken within the lands made available and all stands of Schedule 3 species will be taped off to prevent accidental spread. An Invasive Alien Species Avoidance and Management Plan will also be prepared by an ecologist/invasive species specialist and shall build on the baseline data presented in this statement, including the findings of the pre-construction survey. The Plan will include any measures to manage, control or eradicate any identified Schedule 3 species prior to and during the construction phase of the Proposed Scheme. The plan will also identify any licensing or approvals necessary from NPWS, EPA or other to enable the implementation of the plan.

Based on the findings of the pre-construction surveys, mitigation for each of these species set out in the EIAR will be reviewed and, if necessary, augmented accordingly by the ECoW; particularly with respect to whether any derogation licensing or other approvals are triggered by the findings of the pre-construction surveys. Any adjustment to the mitigation measures will be agreed with the Client in advance of them being implemented.

The pre-construction surveys will be supplemented by further inspection of any identified otter holt/resting site, kingfisher nest or IAPs stand by the ECoW (as deemed necessary by them) immediately prior to site clearance.

7.2.3 Pre-Construction Ground Investigation and Archaeological Testing

The following mitigation measures will be implemented prior to and during the completion of the pre-construction ground investigations and archaeological testing.

7.2.3.1 Within the Proposed LMA

The following mitigation will be implemented prior to the construction phase during ground investigation works. Ground investigation works will consist of a mix of percussion drilling and rotary coring.

- An ECoW and a suitably-qualified and experienced Project Ecologist will be appointed by MCC to supervise the proposed GI works and to ensure compliance with relevant legislation, planning conditions and to ensure the implementation (in whole or part) of the mitigation measures in the planning approval as may be granted as relevant to the pre-construction GI works;
- No ground investigation testing will be permitted outside the lands made available for the Proposed Scheme;
- Works at sensitive locations will be carried out under the strict supervision of and to the approval of an ECoW appointed to supervise the works;
- Ground investigation will not be undertaken within 10m of the River Boyne;
- Soil/subsoil removed for GI works will be piled near to the trench and a minimum 10 m setback from watercourses. Each excavation will be backfilled as soon as possible to avoid prolonged exposure and to ensure sediment does not erode or wash away;
- Each location for excavation will be assessed for potential pathways for run-off to the River Boyne and measures to prevent uncontrolled run-off will be implemented (see **Section 7.3.2.4** and below):
  - Silt barrier fencing will be used around excavations to prevent uncontrolled run-off.
  - Each excavation will be backfilled as soon as possible to avoid prolonged exposure and to ensure sediment does not erode or wash away.

  - Works will be carried out under the strict supervision of and to the approval of an ECoW appointed to supervise the works.
  - When working within the flood plain of the river Boyne, weather conditions will be closely monitored and works will not be undertaken when periods of heavy rainfall are predicted, which could result in flooding of the area.
  - Plant will not be left within the flood plain overnight and will be mobilised daily as required from locations outside the flood plain.
  - Considering the nature of the existing soft ground within the flood plain area, access into the site will be a carefully controlled process. Access will be from the existing Boyne Canal towpath and bog mats will be placed over the existing ground in advance of machinery, such as borehole rigs and excavators entering into the area. At each location of an excavation, a silt barrier fence will be erected around the site to prevent any run-off reaching the river as the excavation takes place and excavated materials temporarily stored within the area protected by the silt fence. Each excavation will be backfilled as soon as practicable and vegetated topsoil reinstated on completion.
  - All hydrocarbons will be stored and all refuelling will take place outside the floodplain of the SAC.

- Existing field access points/routes will be used to avoid disturbance/removal of hedgerows, trees and scrub. In the event that such field access points/routes are not available, the removal of hedgerows, trees and scrub will be minimised to only the extent required for access. Any vegetation removal will be completed outside the breeding bird season (March to August, inclusive) unless the Project Ecologist has confirmed that no breeding birds, their active nest or dependent young are present immediately prior to the works commencing. Any trees needing to be removed will be assessed for bat roosting by the Project Ecologist prior to them being removed and any derogation requirements identified and implemented according to any derogation licence obtained.
- With respect to the pre-construction archaeology investigations, the TII Project Archaeologist will liaise with the Project Ecologist for the Proposed Scheme, in advance of any disturbance, with regard to the mitigation strategy for terrestrial ecology. The archaeology testing strategy will have regard for the Guidelines for the testing and mitigation of the wetland archaeological heritage for national road schemes (NRA, 2005).

7.2.3.2 Within the River Boyne Floodplain

In addition to the measures detailed above (**Section 7.2.3.1**), the following measures will also be implemented when undertaking ground investigation works within the River Boyne floodplain:

- Works within the River Boyne floodplain will be carried out under the strict supervision of and to the approval of an ECoW appointed to supervise the works;
- Access to the River Boyne floodplain will be from the existing Boyne Canal towpath and ground protective bog mats will be put in place prior to the commencement of any works within the River Boyne floodplain;
- When working within the flood plain of the river Boyne, weather conditions will be closely monitored and works will not be undertaken when periods of heavy rainfall are predicted, which could result in flooding of the area;
- Plant will not be left within the flood plain overnight and will be mobilised daily as required from locations outside the flood plain;
- Core samples in the River Boyne floodplain shall only be taken during the bridge foundation construction period and at the same locations as the bridge piers to avoid further ground disturbance; and
- Disturbed areas of soil will be returned to its former use.

With respect to the archaeological testing, in addition the following mitigation measures will be implemented:

- Archaeological testing of areas of archaeological potential located within the floodplain of the River Boyne (ACH05 & ACH08) will minimise ground disturbance. To achieve this, testing within the floodplain will be carried out (ground conditions allowing) after the advanced testing programme, within the

footprint of the coffer dams and attenuation ponds, if necessary, during the site preparation works phase and before construction takes place;

- Core sampling within the River Boyne floodplain will take place during the bridge foundation construction period and at the same locations as the bridge piers to avoid further ground disturbance;
- No test-trenches will be placed within 10m of the River Boyne or any other waterways crossed by the Proposed Scheme;
- Where trenches are in proximity to watercourses, the material taken out of test trenches shall be placed, as far as possible, on the landward side of the trench.

The TII Project Archaeologist for the proposed scheme will liaise with the Project Ecologist appointed by MCC to supervise the GI and archaeological works with regard to these measures.

7.3 Construction Phase

7.3.1 Environmental Operating Plan (EOP)

An EOP for the Proposed Scheme has been prepared and is available in **EIAR Volume 4, Appendix 5.6**. The EOP contains all the mitigation measures as detailed in the EIAR and this NIS. Following grant of planning consent, the appointed Contractor will be responsible and take ownership of the EOP. Prior to the commencement of construction phase, the Contractor will update the EOP to take account of any conditions attached to planning consent and to include the level of mitigation detail required by that consent prior to commencement of construction for the identified mitigation measures. The updated EOP will be subject to the Client's approval prior to the commencement of construction.

During the construction phase, the Contractor and Client will undertake a monthly review of the implementation of the mitigation measures identified within the approved EOP, taking inputs and feedback from the appointed Environmental Team. Following the completion of the monthly reviews, the Contractor will be responsible for any further updates of the EOP necessary to address any issues identified during the review process. Such updates will be approved by the Client.

The Contractor will be responsible for the implementation in full of the approved EOP throughout the construction phase in accordance with NRA/TII guidelines (refer to **Chapter 5**). The EOP will set out the Contractor's approach to managing environmental issues associated with construction of the Proposed Scheme and provide a documented account to the implementation of the environmental commitments set out in the EIAR and NIS and measures stipulated in the planning conditions.

7.3.2 For the Protection of QI River Lamprey, QI Atlantic Salmon and QI Otter (River Boyne and River Blackwater SAC)

7.3.2.1 Artificial Lighting

Light spill onto the river channel during hours of darkness (i.e. critical bridge lifts) has the potential to form a temporary barrier to the movement of foraging and commuting nocturnal QI species (Otter, River Lamprey and Atlantic Salmon). Measures to control the effects of artificial lighting, shall include:

- During daytime working, all lights shall be turned off prior to darkness periods. This will eliminate any risk to sensitive receptors as a result of lighting used during daytime hours;
- Where artificial lighting is required during periods of night working, directional lighting (i.e. lighting which only shines on roads and not adjacent habitats) shall be used to prevent overspill. This will be achieved by the design of the luminaire and by using accessories such as hoods, cowls, louvers and shields to direct the light to the intended area only; and
- Where lighting may spill (although highly unlikely with application of the above measures) onto nearby habitats, light spill shall not exceed 1 lux. To put this in perspective, 0.2 lux level is equivalent to moonlight (BCI, 2010).

7.3.2.2 Noise Emissions

Noise emissions, have the potential to cause displacement and a barrier to the movement of migrating, and foraging and commuting QI species (otter). A range of best practice control measures shall be adopted for the construction phase, they include:

- Construction noise shall be kept to a minimum in accordance with BS 5228 (2009). To monitor compliance with the specified construction noise level limits, environmental noise monitors will be installed at the selected locations prior to the construction works commencing on site;
- Construction generated vibration at sensitive receptors shall be subject to specified upper limits. Prior to the construction works commencing on site, environmental vibration monitors will be installed at the selected locations;
- Rock breaking methods which minimise noise and vibration shall be used;
- Sheet piles required for the construction of cofferdams and the Boyne crossing foundation shall utilise methods that will minimise the risk of vibration being generated (i.e. piling will be via drilling auger and bucket) and will only be undertaken in daytime;
- Temporary 2.4 m high acoustic barriers shall be installed at the site compounds;
- The contractor shall be required to install additional temporary screening at southern end of the bridge that will be capable of providing a reduction of 10 dB(A) at the nearby noise sensitive locations;
- Construction shall be phased to minimise the duration of activities in each area;
- Where works need to be completed outside normal working hours or the contractor's method statement for any proposed works permission for these works shall be sought from the County Council in advance of any works taking place. The application for such works shall require a detailed noise control plan and follow up report to be prepared;
- A noise and vibration monitoring programme shall be implemented for the duration of the construction phase;
- Full details of the contractor's provision for noise and vibration monitoring and procedures including provisions for publication of monitoring results shall be submitted to and approved by the County Council prior to commencement of work. The County Council shall have discretion to vary the monitoring requirements and publication of results during the course of construction; and
- Blasting is not expected to be necessary for the duration of the construction phase and shall not be permitted during the course of the works.

Additional measures also include:

- Exclusion zones for otter: otters are evidenced as using watercourses throughout the study area, particularly along the River Boyne and its proximal complex of wetland habitats which support suitable feeding and commuting habitat. Otters do not limit their movements to watercourses and can enter hinterlands to search for prey species, such as frogs and newts where available. An exclusion zone and set-back of 10 m from the riverbank is included in the design proposals to accommodate free movement of otter along these riparian habitats. No work shall be permitted within this exclusion zone.

7.3.2.3 Habitat Loss

Habitat loss (topsoil stripping, excavation and filling) within the floodplain of the River Boyne and River Blackwater SAC will occur in order to accommodate Working Platforms 1, 2, 3 and 4 (reno mattresses), which will further accommodate the construction of cofferdams.

In order to minimise impacts of temporary habitat loss within the River Boyne and River Blackwater SAC (i.e. terrestrial habitat used by QI otter), the following measures will be completed:

- Vegetation clearance will be programmed to avoid the bird nesting season (1 March to the 31 August, inclusive);
- Vegetation/surface stripping will not be removed too far ahead of working platform construction in order to minimise erosion, run-off or dust from exposed unvegetated surfaces; and

- Surface vegetation will be carefully removed in turves (i.e. intact block of vegetation and soil) for later re-instatement or re-location elsewhere within the SAC.

In order to remediate temporary habitat loss within the River Boyne and River Blackwater SAC (i.e. terrestrial habitat used by QI otter), the following measures will be completed:

- Monitoring of weather forecasting reports will be undertaken in the lead up to removal of the temporary reno-mattress work platforms such that the works including the subsequent reinstatement will be carried out during an extended settled weather period in which time platforms can be installed when there is low risk of over-bank river flows on the Boyne. This will occur in the spring/summer months when grasses can re-establish within that growing season for protection over the ensuing winter;
- Any ground damage and habitat loss within the SAC will be remediated to ensure that any bare soil is stabilised and habitats returned to their former function. This habitat will be reinstated through reseeding with appropriate wet/damp native meadow grasses following the completion of the construction work;
- Remediation will start as soon as construction works have ceased;
- Remediation will involve the development of a Habitat Restoration and Monitoring plan prepared by a qualified person(s) appointed by MCC in consultation with the NPWS. The plan will be implemented. The plan will detail the following:
  - the re-instatement of stripped surface turves, where possible
  - the use of stabilising materials to allow for natural regeneration through reseeding. Ground remediations will not include the use of artificial fertilisers
  - a monitoring schedule to assess site stabilisation and revegetation progress such as seed germination, recruitment of native species and determining/correcting any problems (i.e. erosion)
  - habitat monitoring will be completed on a monthly basis and once vegetation is established and site stabilisation is achieved, monitoring will continue on a quarterly basis for three years thereafter
  - progress reports will be completed on a monthly basis and once vegetation is established and site stabilisation is achieved, progress reports shall be completed on a quarterly basis for three years;
  - after the three year period (of vegetation establishment) a final report will be prepared which will summarise the following:
    - the name, title, and company of all persons involved in restoration monitoring and report preparation;
    - maps or aerials showing restoration areas and photo documentation
    - an explanation of the methods and restoration techniques used to perform the work
    - a description of the vegetation communities, the size of the restoration area restored, and any maintenance activities completed.
  - the wet meadow habitat will be retained under the control of MCC and it will be managed for the sole benefit of biodiversity in order to complement the existing biodiversity features of the SAC (and SPA).

7.3.2.4 Control of Water Pollution

7.3.2.4.1 General Pollution Control

Suspended Solids

The following measures for erosion and sediment control will be adhered to by the contractor. These measures are proposed to restrict the release of suspended solids from entering watercourses including those directly within or associated via downstream connectivity to the identified European sites.

- There will be no direct discharge of surface water from any element of the works;
- Silt fences and silt traps will be provided for all watercourses during construction and will adhere to IFI (2016) Guidelines;

- Silt fences will comply with the requirements of ASTM D6462 – 19 Standard Practice for Silt Fence Installation and Maintenance (June 2019) (ASTM, 2019);
- Silt control measures will be installed correctly and monitored regularly (i.e. daily by the contractor and weekly by the ECoW). Any remedial measures shall be identified by the ECoW;
- The contractor will monitor weather forecasts for heavy rain and where required, certain works and in particular excavations will cease to minimise exposed soil entering surface water run-off. Excavations for foundation shall be carried out so as to minimise sediment runoff (e.g. soil excavation will not be completed during periods of prolonged or heavy rain (i.e. Met Éireann Amber rain warning);
- Any stockpiles will be located greater than 100 m from any watercourse (not within the boundary of SAC/SPAs) and will be covered with an impermeable material (e.g. tarpaulin);
- Clearly defined working areas, delineated by temporary protective fencing will be required, and are essential to ensure there is a sufficiently large buffer zone between working areas and nearby watercourses and to avoid accidental incursion by personnel, materials or equipment;
- The creation of fords on streams and rivers through the introduction of stone will be prohibited; and
- An Environmental Incident and Emergency Response Plan will be prepared by the contractor detailing the steps to be undertaken in the event of a spillage of chemical, fuel or other hazardous wastes (e.g. concrete) will be put in place by the contactor prior to commencement of construction and will prescribe the process from investigation of the spillage to generating a plan to avoid a future incident occurring.

Pollution with Other Substances

The following guidelines based on Chilibeck et al (1992) and NRA (2005) will be followed for the protection of all watercourses from pollution with other substances:

- The storage of oils, fuel, chemicals, hydraulic fluids, etc. will not occur within 100 m of all watercourses and will be undertaken in accordance with current best practice for oil storage (Enterprise Ireland, BPGCS005) on an impervious base within a bund and appropriately secured;
- All machinery operating in these locations will be steam-cleaned in advance of works and routinely checked to ensure no leakage of oils or lubricants occurs;
- All fuelling of machinery will be undertaken at least 100 m set-back from all watercourses;
- Raw or uncured waste concrete will be disposed of by removal from the site;
- Wash down water from exposed aggregate surfaces, cast-in-place concrete and from concrete trucks will be trapped on-site to allow sediment to settle out. Discharge of the wastewater to water bodies will not be permitted. Clarified water is released to a drain system or removed to a suitable licensed facility
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the site and properly disposed of;
- Oil booms and oil soakage pads will be kept on site to deal with any accidental spillage; and
- Prior to any instream works, the contractor will ensure that all construction equipment is mechanically sound to avoid leaks of oil, fuel, hydraulic fluids and grease.

Use of Concrete

The use and management of concrete, which has a deleterious effect on water chemistry and aquatic habitats and species, in or close to watercourses and waterbodies shall be carefully controlled to avoid spillage. Alternate construction methods have been proposed to ensure avoidance of contamination with concrete, (e.g. use of pre-cast units, stream diversions to undertake works in the dry, and permanent formwork). All avoidance measures will reduce the risks associated with concreting works. Where the use of concrete near water cannot be avoided, (e.g. for in situ stitching), the following control measures will be employed:

- When working in or near the surface water and the application of in-situ materials cannot be avoided, the use of alternative materials such as biodegradable shutter oils shall be used;

- Any plant operating close to the water will require special consideration of the transport of concrete from the point of discharge from the mixer to final discharge into the delivery pipe (tremie). Care will be exercised when slewing concrete skips or mobile concrete pumps over or near surface waters;
- Placing of concrete in or near watercourses will be carried out only under the supervision of the ECoW;
- There will be no hosing of concrete, cement, grout or similar material spills into surface water drains. Such spills shall be contained immediately and runoff prevented from entering the watercourse;
- Concrete waste and wash-down water will be contained and managed on site to prevent pollution of all surface watercourses;
- On-site concrete batching and mixing activities will not be allowed and will be specifically prohibited in the contract documents;
- Washout from concrete lorries, with the exception of the chute, will not be permitted on site and will only take place at the batching plant (or other appropriate facility designated by the manufacturer);
- Chute washout will be carried out at designated locations only. These locations will be signposted. The concrete plant and all delivery drivers will be informed of their location with the order information and on arrival on site;
- Chute washout locations will be provided with appropriate designated, contained impermeable area and treatment facilities including adequately sized settlement tanks; and
- The clear water from the settlement tanks shall be pH corrected prior to discharge (which shall be by means of one of the construction phase settlement facilities) or alternatively disposed of as waste to a licensed facility.

Environmental Incidents and Accidents

- An emergency-operating plan will be established to deal with incidents or accidents during construction that may give rise to pollution within any watercourse. This will include means of containment in the event of accidental spillage of hydrocarbons or other pollutants (including oil booms, soakage pads, etc.);
- Throughout all stages of the construction phase of the proposed road project the contractor will ensure that good housekeeping is maintained at all times and that all site personnel are made aware of the importance of the freshwater environments and the requirement to avoid pollution of all types;
- All hazardous materials on site will be stored within secondary containment designed to retain at least 110% of the storage contents;
- Temporary bunds for oil/diesel storage tanks will be used on the site during the construction phase of the project as appropriate;
- Safe handling of all potentially hazardous materials will be emphasised to all construction personnel employed during this phase of the project and an emergency response plan shall be in place, in case of accidental spillage;
- Raw or uncured waste concrete will be disposed of by removal from the site;
- Any spillage of fuels, lubricants or hydraulic oils will be immediately contained and the contaminated soil removed from the site and properly disposed of; and
- There will be no discharge of un-attenuated water to the adjacent marine environment.

Oil and Chemical Spillages

- The type, size and location of the spill will be identified;
- If possible stop the source of the spill and control the area of the spill;
- If the oil spill is small in nature it will be treated with an appropriate spill kit to reduce the effect of the spillage i.e. a suitable absorbent material will be used to absorb/remove the spill;

- In the event of a significant oil spill occurring, an appropriate licenced contractor will be employed to determine the extent of the area affected and to implement an appropriate clean-up operation in line with suitable standards;
- Material will be removed and disposed of in accordance with the Resource and Waste Management Plan prepared by the contractor;
- In the event of a chemical spill, stop the source of the spill and control the area;
- If the spill is hazardous or toxic in nature warn all in the vicinity use an appropriate clean up kit or if a large spill occurs employ a licenced contractor to carry out remediation works;
- The Project Ecologist will be informed in the event of a spillage occurring. A programme of mitigation will be put into place to address the spill;
- The Project Ecologist will inform MCC so the relevant bodies will be notified;
- All fuels, oils and chemicals will be stored in a designated bunded storage area and stored in a manner that will ensure no environmental impacts occur; and
- Bunds or bunded containers will have a bunded capacity of 110% of the largest tank or 25% of the total volume of material stored.

Plant Management

- All plant will be checked and active monitoring carried out to prevent leaking of hydrocarbons/chemicals;
- Stationary plant machinery will have drip trays located beneath if located within an environmentally sensitive area;
- When refuelling, care will be taken to prevent spills by using appropriate equipment;
- Where feasible, refuelling will take place at least 50-100 m away from watercourses;

Unauthorised Waste Disposal

- All waste generated on site will be transported by a permitted waste carrier and suitably disposed of at a licensed waste facility;
- No waste will be buried, burnt, dumped on-site or in land adjacent to the site as this will be considered as unauthorised waste management; and
- In the event of unauthorised waste management, the cause and impact will be assessed.

Dust Suppression and Water Abstraction

- Abstraction from local water courses for use as dust suppression will not take place.
- Wheel washes will be self-contained systems that do not require discharge of the wastewater to water bodies and water misting or sprays shall be used as required if particularly dusty activities are necessary during dry or windy periods.
- Site roads shall be regularly cleaned and maintained as appropriate.
- Hard surface roads shall be swept to remove mud and aggregate materials from their surface while any un-surfaced roads shall be restricted to essential site traffic only.
- Any site roads with the potential to give rise to dust will be regularly watered, as appropriate, during dry and/or windy conditions (also applies to vehicles delivering material with dust potential).
- Stockpiling of materials will be designed and laid out to minimise exposure to wind.

7.3.2.4.1.1 River Boyne

An ECoW will be employed by the contractor to be present during key parts of the construction phase in order to protect water quality and avoid potential impacts on aquatic receptors. General control measures in

order to prevent waterborne pollutants from entering the River Boyne during the construction of the Boyne bridge crossing, include:

- Monitoring of weather forecasting reports will be undertaken in the lead up to construction of the temporary work platform such that installation of reno-mattresses will be carried out during an extended settled weather period in which time platforms can be installed when there is low risk of over-bank river flows on the Boyne;
- All sources and pathways of sediment loss will be controlled according to details set out in Phases 1-5 of the construction methodology (see **Section 2.2** and **Section 7.2.1**)

  This will require a documented schedule of daily, weekly and monthly implementation and efficacy checks of all water quality protection measures in the areas of sediment control and treatment (e.g. silt fences, check-dams, attenuation ponds). A proposed monitoring schedule is set out in **Section 7.3.2.4.2**;
- During and immediately after heavy periods of rain, earthmoving activities shall be reviewed with temporary restrictions where necessary while sediment control measures are bolstered and / or ground dries out to the point that sediment wash-out is not occurring;
- All sources and pathways of concrete loss will be controlled according to details set out in Phases 1-5 of the construction methodology (see **Section 2.2** and **Section 7.2.1**)

  This will require a documented schedule of daily, weekly and monthly implementation and efficacy checks of all water quality protection measures in the areas of concrete and concrete wash-water control and treatment (e.g. pH monitoring of pump-out waters and attenuation ponds). A proposed monitoring schedule is set out in **Section 7.3.2.4.2**;
- All sources and pathways of hydrocarbon loss are controlled according to details set out in Phases 1-5 of the construction methodology (see **Section 2.2** and **Section 7.2.1**)

  This will require a documented schedule of daily, weekly and monthly implementation and efficacy checks of all water quality protection measures in the areas of hydro-carbon storage and control (e.g. storage and refuelling areas). A proposed monitoring schedule is set out in **Section 7.3.2.4.2**;
- A Surface Water Monitoring Programme will be prepared by the contractor and employed to monitor functionality and effectiveness of the prescribed mitigation measures throughout the proposed Boyne bridge construction period. The programme will include identified trigger points and actions relating to principal pollutants (sediment or concrete wash out); and
- Silt fences will comply with the requirements of ASTM D6462 – 19 Standard Practice for Silt Fence Installation and Maintenance (June 2019) (ASTM, 2019) and will also include a double geotextile layer where works are to be completed within the vicinity of the River Boyne.

7.3.2.4.1.2 Cofferdam Water Ingress

Control measures in order to prevent waterborne pollutants from entering the River Boyne during the construction of the Boyne bridge (i.e. bridge foundations and piers within the floodplain), include:

- On-site pumps will be present to dewater as required at cofferdam containment areas;
- On-site containment storage facilities of sufficient volume will be present to hold this pump out water prior to removal for appropriate treatment;
- Ingress water will not be directly discharged to either the River Boyne or any adjoined drainage channels. In the absence of appropriate treatment, pump-out water will not be directly discharged to the attenuation ponds or general environment at any other location;
- Pump-out water will be regularly monitored for pH, hydrocarbons and TSS. A proposed monitoring schedule is set out in **Section 7.3.2.4.2**; and
- Stored contaminated cofferdam pump-out water will be pH monitored (see **Section 7.3.2.4.2**) and removed for treatment at an appropriate licenced off-site facility. If treated for pH the pump-out water will be discharged to the site attenuation ponds for attenuation of TSS and hydrocarbon.

7.3.2.4.1.3 Mattock (Mooretown) Stream

Control measures in order to protect aquatic habitats and species within the Mattock (Mooretown) Stream include:

- No in stream works on the Mattock (Mooretown) Stream will be carried out without the agreement of Inland Fisheries Ireland (IFI);
- The Mattock (Mooretown) Stream will be treated as fish bearing (trout, eel, brook lamprey). As per fisheries restrictions stipulated by IFI, any instream works shall, therefore, be carried out during the period 1 July to 30 September of any year;
- The finalised culvert designs and stream crossing method statement will be agreed with IFI;
- Box culverts will be laid to meet the gradient of the existing channel and will be subject to a minimum embed of 500 mm. Similarly, a pipe culvert on the Slane stream drain (tributary of the Mattock) must be a minimum of 900 mm diameter and be subject to embed of 300 mm, laid at the same gradient as the existing bed level; and
- As a precaution, the Mattock (Mooretown) Stream will be de-stocked of fish as part of instream works covering the reach of the 3 No. locations for culvert installation. Fish removal shall be carried out only by authorised personnel under electro-fishing licence and in agreement with, or under supervision of IFI.

Control measures in order to prevent waterborne pollutants from entering the Mattock (Mooretown) Stream during culvert installation, include:

- A suitable method for culvert installation and channel realignment will be agreed with IFI prior to works commencing;
- A temporary diversion is proposed in order for culvert installation and channel realignment to be carried out in dry conditions with no severance of channel continuity during the construction period;
- The temporary diversion channel will be of a calculated width and depth that will pass high frequency flood events (at least Q_{med}). The channel will be constructed in advance, off-line, with a soil/vegetation bund between it and the stream;
- The channel will be lined with appropriate waterproof geo-textile material and the bottom of the channel lined with appropriate, locally sourced, low-fine content gravels of a size class agreed in advance with IFI;
- There can be no crossing of the temporary channel by machines and no direct discharge of pollutants or pump-out water to the diversion channel from the construction works area. Water may ingress to the works area, and all such construction related pump-out water will be directed to Attenuation Pond 6A (which will be constructed in advance of main works) for settlement of suspended solids; and
- Silt fences will comply with the requirements of ASTM D6462 – 19 Standard Practice for Silt Fence Installation and Maintenance (June 2019) (ASTM, 2019) and will also include a double geotextile layer where works are to be completed within the vicinity of the Mattock (Mooretown) stream.

7.3.2.4.2 Surface Water Monitoring Procedure

As part of the EIAR and this NIS, surface water quality monitoring procedures are specified during the construction works.

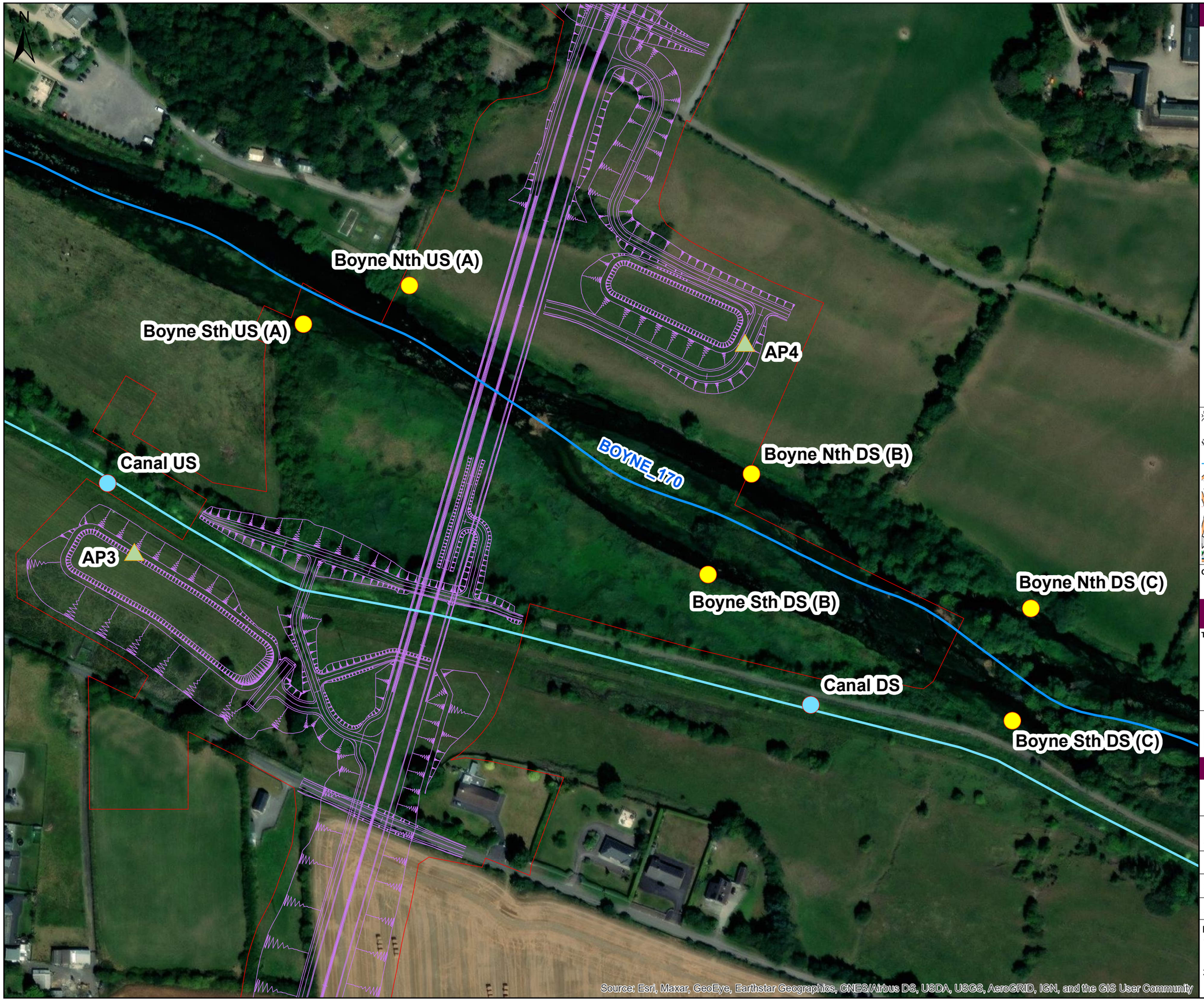
7.3.2.4.2.1 River Boyne Monitoring Locations

Samples must be taken from each bank (north and south) with a long reach sampling pole, collecting from as far out into the channel as is practicable. There will be 6 No. monitoring points on the River Boyne in relation to the bridge crossing reach, 2 No. attenuation pond outfalls and 2 No. locations on the canal as illustrated in **Figure 7.1** and explained as follows:

- 2 No. upstream A sites: one from each bank at locations immediately upstream of the crossing works reach that are outside the influence of the project;
- 2 No. downstream B sites: one sample from each branch of the Boyne, north and south of the mid-channel island, 100 m downstream of the Boyne bridge pier work platforms;

- 2 No. downstream C sites: one sample taken from each bank of the river a further 200 m downstream of the above sites i.e. a total of 300 m downstream of the Boyne bridge pier work platforms;
- Canal: one sample upstream of Attenuation Pond 2 outfall and one sample approx. 250 m downstream; and
- Outfall channels of Attenuation Ponds 2 and 3.

See Sample Frequency below for the schedule of sampling.



Legend

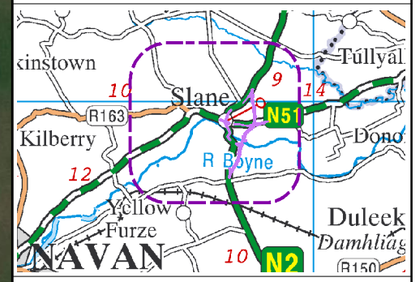
- Proposed Scheme
- Proposed Scheme Boundary
- EPA River Water Body
- Boyne Navigation Canal

Monitoring Location

- River Sample Site
- Canal Sample Site
- Attenuation Pond Outfall (AP)

Data Source: EPA River Water Bodies Cycle 3 2021

0 25 50 100
Meters



Client
Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title
Figure 7.1

River Boyne Construction Phase Monitoring Locations

West Pier
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Issue Details

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7.3.2.4.2.2 Mattock (Mooretown) Stream Monitoring Locations

There will be 2 No. monitoring points on the Mattock (Mooretown) stream relating to culverting works and 3 No. attenuation pond outfalls as illustrated in **Figure 7.2** and explained as follows:

- 2 No. downstream C sites; one sample taken from each bank of the river a further 200 m downstream of the above sites i.e. a total of 300 m downstream of the Boyne bridge pier work platforms; and
- Attenuation Ponds 5A, 5B and 6A outfall channels.

See Sample Frequency below for the schedule of sampling.

Legend

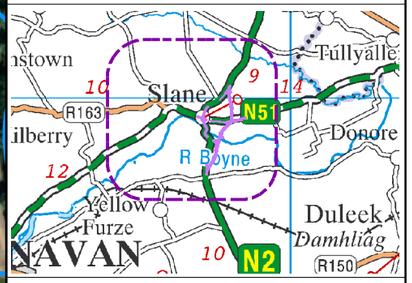
- Proposed Scheme
- Proposed Scheme Boundary
- EPA River Water Body

Monitoring Location

- River Sample Site
- Attenuation Pond Outfall (AP)

Data Source: EPA River Waterbodies Cycle 3 2021

0 50 100 200 Meters



Client

Meath County Council

N2 Slane Bypass and Public Realm Enhancement Scheme

Title

Figure 7.2

Mattock (Mooretown) Stream Construction Phase Monitoring Locations

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7.3.2.4.2.3 Sample Parameters

The meaningful parameters for this construction phase surface monitoring programme are suspended solids/ turbidity (related to potential sediment loss from the site) and pH (related to potential concrete run-off).

Turbidity and pH measurements must be taken at all sampling sites during construction using a portable probe. In-situ measurements have the advantage of providing site management with immediate (and actionable) data. In contrast total suspended solids (TSS), for example, may take a week or more to be analysed and reported. Notable pH changes upstream and downstream of the construction area may indicate concrete contamination and would trigger a stop-work response to identify and remove the source of contamination.

Where routine turbidity measurements show that there may be impact on the receiving waters, additional measurements must be taken with the probe (working back towards the possible source areas) to determine the source of elevated suspended sediment, e.g. by checking attenuation pond outflows etc. This will trigger works to stop until the offending sediment source is remedied.

7.3.2.4.2.4 Sample Frequency

River Boyne – Sampling Plan

The 8 No. river/canal sites shown in **Figure 7.1**, plus the outflows from Attenuation Ponds 2 and 3, will be sampled by the ECoW during the period of construction on the Boyne floodplain with the following frequency:

Daily sampling at each site:

- Turbidity measurement in-situ, using a hand-held (portable) turbidity meter (NTU); and
- pH measurement in-situ, using hand-held (portable) calibrated meter (pH units).

Twice weekly sampling (fixed days - Monday & Thursday) at each site:

- Discrete grab sample and laboratory analysis for suspended solids (mg/l) and turbidity.

Additional sampling during 2 elevated flow (rainfall) events per month at each site:

- Turbidity measurement in-situ, using a hand-held (portable) turbidity meter (NTU);
- pH measurement in-situ, using hand-held (portable) calibrated meter (pH units);
- Discrete grab sample and laboratory analysis for suspended solids (mg/l) and turbidity.

There are likely to be days when there is no outflow from the Attenuation Ponds, and hence no grab sample or in-situ readings from those locations. This will be logged as "*No sample – No flow*" in the daily monitoring sheet. Upstream (US) and downstream (DS) samples on the Boyne River and Boyne Canal will still be taken on such days.

The ECoW will ensure that samples are taken during or immediately after heavy rainfall whenever a rain event is occurring because these are the periods during which water in on-site drains and ground surfaces become hydrologically active and export diffuse contaminants including suspended solids.

Mattock (Mooretown) Stream – Sampling Plan

Water monitoring for the Proposed Scheme revealed persistently high suspended sediment concentrations in the Mattock (Mooretown) stream. For this reason, a scaled back monitoring schedule will be undertaken for this tributary. The 2 No. stream sites shown in **Figure 7.2**, will be sampled by the ECoW during the period of construction in the vicinity of the proposed N2 tie-in with the following frequency:

Twice weekly sampling (fixed days – Tuesday and Friday) at each site:

- Turbidity measurement in-situ, using a hand-held (portable) turbidity meter (NTU);
- pH measurement in-situ, using hand-held (portable) calibrated meter (pH units).

Sampling during 2 elevated flow (rainfall) events per month at each site:

- Turbidity measurement in-situ, using a hand-held (portable) turbidity meter (NTU);

- pH measurement in-situ, using hand-held (portable) calibrated meter (pH units);
- Discrete grab sample and laboratory analysis for turbidity and suspended solids (mg/l) and turbidity.

The outflows from Attenuation Ponds 5A and 5B will be checked following every heavy rainfall event and when they are actively flowing will be sampled as follows:

- Turbidity measurement in-situ, using a hand-held (portable) turbidity meter (NTU);
- pH measurement in-situ, using hand-held (portable) calibrated meter (pH units);
- Discrete grab sample and laboratory analysis for turbidity and suspended solids (mg/l) and turbidity.

7.3.2.4.2.5 Visual Checks

Underpinning the monitoring approach will be daily visual checks conducted by the ECoW to ensure all mitigation measures are implemented as set out in this NIS. These visual checks will include checks on integrity of all on-site mitigation infrastructure, e.g. attenuation ponds, silt fencing, on-site drainage flow paths etc. Any required maintenance will be carried out immediately. The ECoW will have powers to stop works if there are obvious sediment plumes in watercourses or any obvious pathways from the construction areas that are conveying sediment laden water to nearby drains or watercourses. In the instance that works must stop, the source(s) and/or reasons for observed sediment loss will be identified and controls will be bolstered through additional silt fencing, check-dams or pump-out and containment of runoff for off-site treatment.

7.3.2.4.2.6 Monitoring Records

An example daily Water Monitoring Sheet (see **Appendix 1.6 – Example Daily Water Monitoring Sheet**) will be filled in by the ECoW at each sample location recording sampling date and times for each individual sample, plus general flow condition (High, >Average, Average, <Average, Low). Any visible turbidity or discoloration of the water will be recorded. The register of daily monitoring sheets will be kept on-site and entered into an Excel spreadsheet and will be updated regularly for inspection by the construction Site Manager.

7.3.2.4.2.7 TSS versus Turbidity Correlation

Turbidity data is not possible to interpret in any meaningful way in the absence of data on suspended solids, and/or) without being continuously monitored using upstream/downstream instream sondes. Experience during the EIAR water monitoring phase proved that continuous turbidity measurement on the Boyne is unreliable owing to the swift flows and possible issues with turbulence and biofouling.

Furthermore, there is no standard conversion factor between turbidity and suspended solids; each river is different owing to variable geology, soil type etc. Handheld turbidity meter data must be correlated with concurrent suspended solids data in order to interpret the information. It is considered that suspended solids sampling (whether correlated with turbidity or not) is cost effective, reliable and produces more easily interpretable data which can be compared to existing Irish water quality standards (e.g. 25 mg/l threshold for salmonid waters).

In order to utilise in-situ turbidity information for actionable indications of construction impact, a broad correlation will be made between the in-situ turbidity data and laboratory analysed suspended solids concentrations. Data must comprise at least 15 elevated / high flow periods and about 30 instances of a range of elevated flows in order to form a practical correlation using the daily/monthly data collected by the ECoW. It is recommended that monitoring of high flow events begins in the pre-construction phase, i.e., as soon as possible following scheme approval.

A once-off professional TSS / turbidity correlation will be undertaken using an approved laboratory and laboratory-based methods to form a reliable relationship between the parameters. The relationship is sediment-specific and unique for each river system, therefore the method requires samples of local sediments and river waters to be taken to the lab for gravimetric analysis of TSS and concurrent turbidity. The samples are mixed in increasing dilutions to provide the specific TSS/ turbidity relationship. The exact turbidity meter type that will be deployed in the field will be calibrated by this relationship.

Once a rational correlation is made, in-situ daily turbidity readings will be used in lieu of ongoing additional monthly high flow grab sampling for suspended solids. Turbidity probes will be regularly re-calibrated. Twice

weekly (Monday and Thursday) suspended solids sampling will continue throughout the construction period on the Boyne.

7.3.2.4.2.8 Trigger Levels

Watercourses – Suspended Solids / Turbidity

Once the relationship between suspended solids and turbidity is established (by either method outlined above), a suspended solids / turbidity trigger level will be set for works to stop in order to implement additional on-site measures for sediment control. The trigger level to stop work and implement additional sediment control measures is if there is an upstream/downstream difference of 25 mg/l suspended solids, or the correlated (as above) turbidity equivalent (NTU). Alternatively, the trigger level will be set at any-change in turbidity between upstream and downstream sites on the Boyne River, although it will still be necessary to continue collecting twice weekly and three times monthly suspended solids samples for analysis as a log of efficacy and to assist interpretation of turbidity data.

Watercourses – pH

According to Surface Water Regulations[40], the acceptable pH range for these surface waters is: 6 < pH < 9.0. The Boyne and Mattock (Mooretown) stream both had ambient values of pH 7.3 - 8.3, with means (August 2021 – March 2022) of pH ~7.8.

The trigger level to stop (concrete related) works will be if there is any in-situ upstream / downstream difference in pH that indicates more alkaline conditions downstream with pH approaching 8.5-9.0 at the downstream site, along with a clear difference compared to upstream in-situ pH value.

Attenuation Pond Outfalls

Suspended solids concentrations in attenuation pond outfall channels should not exceed 25 mg/l TSS or the turbidity (NTU) equivalent and pH will not exceed 9.0. These are the trigger levels, either separately or together that trigger works to stop and additional appropriate control measures to be implemented following investigation/ evaluation of the source by the ECoW. Works will not recommence without agreement from the ECoW.

7.3.2.4.2.9 Cofferdam Pump-out Water Monitoring

Constant water ingress is expected to the cofferdams surrounding bridge pier foundations during their construction. These containment areas will require regular, if not constant pumping out to retain dry conditions.

The pump-out water is likely to be contaminated with sediment and concrete, and to a lesser extent hydrocarbons. These waters shall not be pumped directly to the Boyne or to any other watercourse. The contractor will be required to tanker and remove to a suitably licensed treatment facility.

Before any concrete pouring has commenced, i.e., in the earth excavation stage, the ECoW will take daily pH readings of a sample of the pump-out water. This water will be transported by tanker and discharged into Attenuation Pond No. 2 or 3 for settlement of suspended solids. Once bulk liquid concrete pouring has commenced and concrete is curing, the ECoW will continue daily in-situ measurement of pump-out water. If pH remains between 6.0 and 9.0, then this water can still be discharged into the Attenuation Ponds for settlement of suspended solids. If pump-out water pH exceeds 9.0, the water will be treated to reduce pH, or transported off-site for disposal at a licenced facility.

7.3.2.5 Accidental Killing/Injury

The following mitigation will be implemented in order to protect QI Otter.

7.3.2.5.1 Mammal-resistant Fencing

Otters may potentially be affected during the construction phase of the development during foraging activities (based on existing survey evidence). The potential for fatalities from road traffic accidents on site or

[40] European Communities Environmental Objectives (Surface Waters) Regulations (S.I. 272 of 2009).

becoming trapped within open works could pose a direct impact. Mitigation measures to protect the accidental killing/injury of otter during the construction phase are detailed as follows:

- Maintain the 10 m set back zone from both banks of the River Boyne to ensure the free movement and safe passage of otter along the watercourse during construction phase (i.e. habitat will not bisected);
- Pre-construction surveys will be undertaken to ensure that otter has not taken up residence or established any new territories (i.e. since baseline surveys were undertaken, see **Section 4**) within or in close vicinity to the footprint of the Proposed Scheme (see **Section 7.2.2**);
- Temporary otter fencing will be used to enclose all construction working areas 200 m to the south of the canal, between the canal and the River Boyne, 200 m to the north of the River Boyne and 200 m upstream and downstream of the Mattock (Mooretown) Stream;
- Taking consideration of the NRA Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (NRA, 2006b), mammal-resistant fencing will be incorporated along the boundary of construction compounds, working areas and reno-mattresses to ensure no otters can access or become trapped within open works. Mammal-resistant fencing will adhere to the relevant specifications as set out by the NRA (2006b) (see **Figure 7.3**);
  - Fences will be constructed and erected in accordance with Irish Standard (I.S.) 435: 2005 (updated version available - I.S. 435-1:2017);
  - Where appropriate, fences will stretch at least 25 m and preferably to 50m or more either side of watercourse crossings;
  - Any length of fencing (including branches and spurs) will start with a post and end with a post. An additional post will be provided at fence junctions and at fence corners;
  - Posts (2100 x 150 x 75) will be erected 2100 mm above ground level, 700 mm below ground and 2100 mm apart;
  - Rails (4200 x 100 x 44) will be spaced out between 200 and 250 mm from ground level (i.e. the two rails closest to ground level will be spaced 200 mm apart, with the remaining two furthest from ground level spaced 250 mm apart);
  - Chain-link mesh will be 1800 mm wide, consisting of 60 mm mesh made up of a diameter of 2.25/3.15 mm. Mesh will be plastic coated galvanised mild steel wire and erected with a 200 mm section below ground level and recovered with excavated material; and
  - Post holes falling in rock shall be excavated to a depth of 700 mm or with an Engineer's approval to a depth of 500 mm. Where a reduced depth of hole is accepted by the Engineer, the top of the post will be suitably cut and treated with preservative.
- Once installed, the mammal-resistant fencing will be inspected by the Contractor's Project Ecologist to ensure that fencing is fit for purpose (i.e. adequate for the exclusion of otter and any damaged sections mended within 24hrs of being identified).

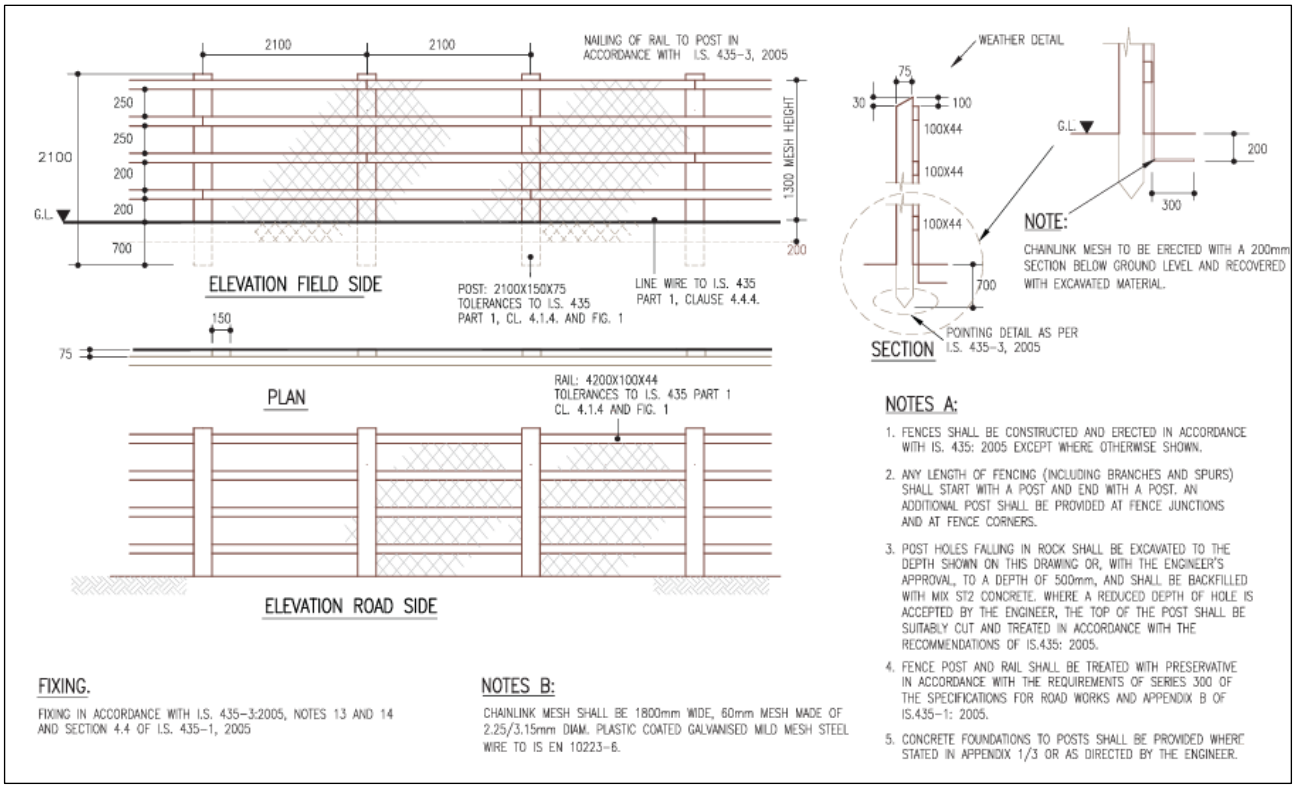

Figure 7.3: Specification For Mammal-Resistant Fencing (NRA, 2006b)

7.3.2.5.2 Monitoring of Mammal-resistant Fencing

In order to ensure the effectiveness of the exclusion of otter from open works during the construction phase, mammal-resistant fencing requires monitoring and maintenance at regular intervals. Naturally, a sturdy fence requires less maintenance, however digging by animals and damage from machinery may contribute to reduced fence robustness. If damage occurs, the main purpose of the fence is jeopardized. Monitoring measures will include:

- Weekly inspection will be undertaken by the Contractor's Project Ecologist in order to identify and fix potential fencing problems (e.g. 'weak spots');
- If potential problems are identified by personnel between weekly inspections, the Contractor's Project Ecologist will be notified and restorative actions agreed and implemented by the Contractor;
- Any problems identified, such as damage or weak spots, will be rectified within 24 hrs of being identified.

7.3.3 For the Protection of QI Alluvial Forest (River Boyne and River Blackwater SAC)

7.3.3.1 Control of Water Pollution

The mitigation at **Section 7.3.2.4** shall be implemented for QI Alluvial Forest.

7.3.3.2 Spread of Invasive Alien Plant Species

The presence of invasive alien plant species has the potential to lead to an offence under the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477 of 2011) as amended.

Two non-native invasive species, Japanese Knotweed and Himalayan Balsam, were recorded within the vicinity of the Proposed Scheme. These species are highly invasive and out-compete native flora to form single species stands. The following standards and guidelines will be followed in relation to non-native invasive plant species:

- Transport Infrastructure Ireland guidance (TII, 2020a), entitled: 'The Management of Invasive Alien Plant Species on National Roads – Standard' https://www.tiipublications.ie/library/GE-ENV-01104-01.pdf;
- (TII, 2020b), entitled: 'The Management of Invasive Alien Plant Species on National Roads – Technical Guidance' https://www.tiipublications.ie/library/GE-ENV-01105-01.pdf;
- Appropriate mitigation measures including management and control measures are required at all sites within the Proposed Scheme area where these species are encountered. Person(s) must therefore take all reasonable steps and exercise due diligence to avoid committing an offence under the 2011 regulations, as amended.

The following mitigations will be followed in relation to non-native invasive plant species:

- An Invasive Species Management Plan (ISMP) shall be prepared by the contractor and will include management protocols for dealing with occurrences of scheduled invasive species in compliance with the relevant legislation. The measures within the ISMP will contain, as a minimum, the mitigation measures set out within this NIS;
- An invasive species survey will be completed at pre-construction phase by a qualified person(s) to check for new growths and identify any new-established plant species within the footprint of the Proposed Scheme;
- All machinery entering the site during construction activities shall be free from contamination with scheduled invasive plants. The early installation and mandatory use of the wheel wash will be required to control this risk;
- Any materials which are introduced to the site during the construction shall be free from scheduled invasive species, with certification of such from the supplier stating that they have not knowingly been sourced from an area known to be infected; and
- Where a scheduled invasive species is accidentally introduced or becomes established within the area of the Proposed Scheme during pre-construction surveys and/or the construction phase, works shall be immediately halted and an effective exclusion zone will be erected (minimum 7 m) until such time that a suitably qualified ecologist/ invasive species specialist will assess the site(s), and implement/update the required management protocol.

7.3.4 For the Protection of QI Estuaries, QI Mudflats and Sandflats, QI Atlantic Salt Meadows, QI Mediterranean Salt Meadows and QI Salicornia (Boyne Coast and Estuary SAC)

7.3.4.1 Control of Water Pollution

The mitigation at **Section 7.3.2.4** shall be implemented for QI Estuaries, QI Mudflats and Sandflats, QI Salt Meadows and QI Salicornia.

7.3.5 For the Protection of SCI Kingfisher (River Boyne and River Blackwater SPA)

7.3.5.1 Control of Water Pollution

The mitigation at **Section 7.3.2.4** shall be implemented for SCI Kingfisher.

7.3.5.2 Artificial Lighting

The mitigation at **Section 7.3.2.1** shall be implemented for SCI Kingfisher.

7.3.5.3 Noise Emissions

The mitigation at **Section 7.3.2.2** shall be implemented for SCI Kingfisher.

7.3.6 For the Protection of SCI Northern Lapwing and Golden Plover (Boyne Estuary SPA)

7.3.6.1 Artificial Lighting

The mitigation at **Section 7.3.2.1** shall be implemented for SCI Northern lawing and SCI Golden plover.

7.3.7 For the Protection of SCIs Shelduck, Oystercatcher, Knot, Sanderling, Black-tailed Godwit, Redshank, Turnstone and Little Tern (Boyne Estuary SPA)

7.3.7.1 Control of Water Pollution

The mitigation at **Section 7.3.2.4** shall be implemented for SCI Shelduck, SCI Oystercatcher, SCI Knot, SCI Sanderling, SCI Black-tailed Godwit, SCI Redshank, SCI Turnstone and SCI Little Tern.

7.3.8 For the Protection of QI Wetlands (Boyne Estuary SPA)

7.3.8.1 Control of Water Pollution

The mitigation at **Section 7.3.2.4** shall be implemented for QI wetland habitat.

7.3.9 For the Protection of SCIs Cormorant, Lesser Black-Backed Gull, Black-Headed Gull and Herring Gull

7.3.9.1 Artificial Lighting

The mitigation at **Section 7.3.2.1** shall be implemented for SCIs Cormorant, Lesser Black-Backed Gull, Black-Headed Gull and Herring Gull.

7.3.9.2 Control of Water Pollution

The mitigation at **Section 7.3.2.4** shall be implemented for SCIs Cormorant, Lesser Black-Backed Gull, Black-Headed Gull and Herring Gull.

7.3.10 For the Protection of SCIs Cormorant, Lesser Black-Backed Gull, Black-Headed Gull, Herring Gull, Red-Throated Diver, Common Scoter, Common Gull, Great Black-Backed Gull, Common Tern, Arctic Tern, Little Tern, Shag and Little Gull

7.3.10.1 Control of Water Pollution

The mitigation at **Section 7.3.2.4** shall be implemented for SCIs Cormorant, Lesser Black-Backed Gull, Black-Headed Gull, Herring Gull, Red-Throated Diver, Common Scoter, Common Gull, Great Black-Backed Gull, Common Tern, Arctic Tern, Little Tern, Shag and Little Gull.

7.4 Operational Phase

7.4.1 For the Protection of QI River Lamprey, QI Atlantic Salmon and QI Otter (River Boyne and River Blackwater SAC)

7.4.1.1 Drainage Design

As part of the Proposed Scheme, it is proposed to control and attenuate water draining the N2 Slane Bypass. The drainage design will facilitate attenuation/retention and pollution control of drainage water before it is released to receiving aquatic receptors such as streams and watercourses, coastal / intertidal areas and groundwater within the ZoI.

Measures to attenuate and treat carriageway run-off have been incorporated into the drainage design of the proposed N2 Slane Bypass in accordance with TII standards. The Proposed Scheme involves the construction of a new surface water drainage system including new attenuation outfalls to existing watercourses or existing surface water drainage networks.

Furthermore, the proposed alignment crosses a number of existing watercourses, agricultural drains and the River Boyne. Where the Proposed Scheme crosses these they will be accommodated in culverts. The culverts, surface water drainage network, and run-off interceptors have been designed so as to minimise the potential impact on the receiving watercourses.

Attenuation measures in the form of attenuation/retention ponds and grassed surfaced water channels which are considered to be a Sustainable Drainage System (SuDS) are proposed to reduce the rate of run-off discharged to the receiving watercourses. While the purpose of the attenuation/retention ponds and grassed surfaced water channels is to reduce the risk of flooding in the receiving watercourse/ networks, they will also improve water quality by facilitating settlement and deposition of sediment and pollutants carried through the pipe network from the carriageway.

The proposed surface water drainage system also includes measures to reduce the concentrations of pollutants that are routinely found in road surface run-off and which pose a risk of short-term acute impacts (from dissolved/ soluble pollutants) and/ or long-term chronic impacts (from sediment bound pollutants on receiving waters). As part of the proposed surface water drainage design, a Class I by-pass petrol interceptor will be installed upstream of where the drainage collection system discharges into the retention/attenuation ponds.

The hydrocarbon interceptors incorporated within the design of the proposed surface water drainage network are primarily aimed at removing hydrocarbons from run-off. However, in order to ensure that the concentrations of other types of pollutants (e.g. heavy metals and sediment) are controlled, filter drains and vortex grit removal chambers will also contribute to the treatment of surface water run-off from the Proposed Scheme.

Surface water drainage design measures for the scheme are described in **Section 2** of this statement and in **Chapter 4** and **Chapter 5** of the accompanying EIAR.

7.4.1.1.1 Culvert Design – Enhancement

In addition to the culvert drainage design proposed as part of the Proposed Scheme, and the mitigation measures proposed in **Sections 7.4.1.5** to **7.4.1.8**, the following betterment measures are proposed to improve the three culverts located along the Mattock (Mooretown) Stream for the free passage of otter, which may be used by commuting otter outside the boundary of the River Boyne and River Blackwater SAC:

- Culvert construction will take cognisance of the 'Guidelines for the Treatment of Otters during the Construction of National Road Schemes. National Roads Authority' (NRA, 2006b);
- As otters will be disinclined to use water-filled culverts without dry pathways, culverts will allow for the provision of ledges;
- There will be adequate access to any ledges provided from the riverbank next to the ledge;
- The ledges and mammal access paths will be linked (i.e. fencing) and landscaped appropriately so that otters will use them. Ramps will be provided to ensure accessibility to ledges;

- Ledges shall be at least 500 mm wide, constructed at least 150 mm above the 1 in 5 year flood event, and allow at least 600 mm headroom;
- Care will be taken to ensure planting/landscaping does not obscure entrances to wildlife ledges; and
- During operation, quarterly monitoring will be carried out over a period of at least one year to determine the success of the measures employed in an effort to ensure protection of otter.

7.4.1.2 Maintenance of Surface Water Drainage

During the operational phase of the Proposed Scheme, regular inspection will be required in addition to the establishment of a maintenance regime to ensure that the surface drainage network is functioning effectively. These include:

- All maintenance site personnel will be made aware of the importance of the surrounding environment of the Proposed Scheme (i.e. European sites and connectivity with the freshwater environment) and the requirement to avoid pollution of all types:
- Grassed surface water channels will be inspected monthly for the duration of the establishment period (i.e. will vary but generally three months) and will be inspected after heavy rainfall events;
- Filter drains will be inspected monthly;
- Attenuation/ retention ponds will require an inspection every six months;
- Vortex grit removal chambers and petrol/oil interceptors will require monthly inspections for the duration of the first three months and then every three to six months thereafter; and
- Maintenance tasks in relation to the aforementioned surface water drainage to be completed during inspections include (where relevant), but are not limited to:
  - Weed control;
  - Sediment removal/monitoring (i.e. depth) and the unclogging or replacement of filter materials;
  - Removal of litter and other debris;
  - Repair of any damage associated with drainage infrastructures;
  - Vegetation inspection and care (i.e. retention ponds and grassed surface water channels);
  - Cleaning and integrity check.

7.4.1.3 Sediment and Pollutant Control

- Existing and proposed surface water drainage and discharge points shall be mapped on a site plan including the location of existing and proposed measures such as of petrol/oil interceptors, vortex grit separators, sediment traps, attenuation ponds with treatment forebays, grassed channels and filter drains where appropriate;
- Attenuation ponds will be lined and the surface water drainage system sealed to prevent any infiltration of contaminated groundwater into surface water network; and
- To minimise sediment build up, a regular inspection and maintenance regime will be put in place to remove any litter, debris and sediment from drainage features which will be removed to a suitable licensed facility.

7.4.1.4 Environmental Incidents and Accidents

In the case of environmental incidents or accidents occurring during the operational phase of the Proposed Scheme, the following measures will be implemented to help prevent/ contain the contamination of the potential source-vector pathways for negative impacts to proximal European sites:

- All surface water run-off from rainwater that has passed over impermeable surfaces will be collected within the surface water drainage network, which will pass through petrol/hydrocarbon interceptors prior to the discharge into attenuation/retention ponds before it is released into the River Boyne and River Blackwater SAC and SPA;

- In the case of a catastrophic accidental spill or similar incident, each attenuation/retention pond will be fitted with an emergency shut-down facility so that the spillage will be contained and prevent contaminants entering the downstream watercourse;
- As detailed in **Section 7.4.1.2**, the drainage system will be maintained by maintained by Meath County Council.

7.4.1.5 Attenuation Ponds and Wetlands

- Attenuation ponds will be provided at all major surface water outfalls along the length of the road scheme and are designed in accordance with DN-DNG-03063 Vegetated Drainage Systems for Road Runoff Attenuation and DN-DNG-03065 Road Drainage and the Water Environment. Ponds will be designed as hybrid wetlands, so they provide both attenuation and consequent water treatment function. They will be planted with vegetation suitable for the specific zone of the pond the planting is located, i.e., permanently wet, marginal zones, dry earthworks slopes.
- Constructed wetlands (CWs) shall be maintained according to TII Vegetated Drainage Systems for Road Runoff DN-DNG-03063-02. Constructed wetland planting will include (amongst other species) Reed canary-grass (*Phalaris arundinacea)* and Bulrush (*Typha latifolia*), both of which occur naturally in the Boyne valley. These species are metal tolerant and are useful for phytoextraction of Cd, Cu, and Zn (Kacprzak et al., 2014), hence suitable to support constructed wetland treatment function (Healy et al., 2008). Maintenance of CWs requires sediment removal a minimum every 25 years, regular monitoring (for blockages) of inlet and outlet, and repair of planting and landscaping where necessary (NRA, 2014).
- Constructed wetlands and infiltration basins will be lined either naturally with a low permeability clay, or with an artificial membrane liner to protect groundwater, and adjoining surface waters, in accordance with groundwater regulations and surface water regulations. This will ensure separation of surface and groundwater and prevent potential leakage of contaminants to groundwater, which can be a subsurface pathway to surface waters.

7.4.1.6 Invasive Alien Species Management

Two non-native species, Japanese knotweed *Reynoutria japonica*, Himalayan Balsam *Impatiens glandulifera* were recorded in the vicinity of the Proposed Scheme. Although it is very unlikely for the spread of these species during the operational phase, a precautionary approach has been applied due to their location in proximity to watercourses, primarily the River Boyne.

Where these species are encountered and for the prevention of spread of these species, the following guidelines will be followed in relation to non-native invasive plant species:

- The Management of Invasive Alien Plant Species on National Roads – Standard. GE-ENV-01104. (TII, 2020a),
- The Management of Invasive Alien Plant Species on National Roads – Technical Guidance. GE-ENV-01105. (TII, 2020b),
- Guidelines for the Management of Waste from National Road Construction Project (NRA, 2014),
- The Knotweed Code of Practice. Managing Japanese Knotweed on Development sites. UK Environment Agency Environment Agency (2013). Inland Fisheries Ireland guidance regarding aquatic invasive species control (http://www.fisheriesireland.ie/Research/invasive-species), and
- Invasive Species Ireland guidance (http://invasivespeciesireland.com).

An Invasive Species Management Plan, outlining measures to eradicate Invasive species will be prepared by the contractor and will be implemented during all phases of the Proposed Scheme.

7.4.1.7 Mammal-resistant fencing

Mammal-resistant or mammal proof fencing will be required to guide otter under the proposed bridge crossing and to prevent otter (and therefore direct mortality as a result of accidental killing or injury) crossing the new roadway. As a clear span bridge will be adopted, there will no obstruction of otter movement in an east-west direction along the Boyne corridor, however mitigation as detailed below will be required to prevent otter entering the proposed bridge crossing where vehicle movements may be frequent. The specification for

mammal-resistant fencing is given in the NRA guidelines (NRA 2006a and 2006b) and is detailed in **Section 7.3.2.5**. Otter fencing will be recessed at tied into the following chainage points of the Proposed Scheme:

- To guide otter under the proposed bridge crossing, otter fencing will be installed at appropriate locations south of the River Boyne between Ch. 1250 and Ch. 1300, in addition to 150 m either side of this chainage point in parallel with the Boyne towpath, north of the Boyne navigational canal;
- To guide otter under the proposed bridge crossing, otter fencing will be installed at appropriate locations north of the River Boyne between Ch. 1450 and Ch. 1600;
- Where steel single field gates are proposed north and south of the River Boyne (i.e. maintenance track south of the River Boyne, Access Track 4 north of the River Boyne and the farm Overbridge 3), gates will be fitted with chain link mesh (see NRA 2006b) to prevent otter using these points to gain access to the mainline. The location of gates on farm access roads requiring this modification will be determined at the detailed design stage;
- Attenuation Ponds 2 and 3 will remain unfenced to allow the free movement of otter within this habitat;
- To guide otters to culverts along the Mattock (Mooretown) Stream, otter fencing will be installed at Ch. 3440, Ch. 3450 and Ch. 3460, and for a distance of 150 m either side of each culvert;
- Where there is an overlap of stock-proof fencing and mammal-resistant fencing at culvert locations, stock-proof fencing will be adjusted to allow for unimpeded access to the culvert. The fence will be adjusted so that the bottom rail and wire mesh are removed and chain-link is not fixed to the ground at the location of the underpass. This allows for the animals to see a break in the fence line and thus clear access to the underpass nearby. Detail of this will be seen in the NRA (2006a) Guidelines;
- These crossings will be more readily used if the approach is softened through the use of appropriate planting; and
- Mammal-resistant fencing will be incorporated at the earliest possible stage during the operational stage.

Quarterly monitoring to ensure the effectiveness of the exclusion of otter from the mainline and the proposed bridge crossing will be carried out to determine the success of the measures employed. Monitoring will be undertaken by the Client Project Ecologist and continued for at least one year after construction works cease and monitored once every three years for maintenance purposes. Any deficiencies in the measures will be reported to Meath County Council and corrected immediately.

7.4.1.8 Monitoring

Meath County Council will be responsible, during operation, for the commission of a suitably experienced ecologist to monitor the effectiveness of surface water drainage mitigation.

The success of mitigation measures for habitat management and mammals will also be monitored for a period of 3 years after construction. Quarterly monitoring will be carried out to determine the success of the measures employed. Thereafter, mammal fencing will be monitored once every three years for maintenance purposes. Should a pattern of roadkill be identified at any location, a suitably qualified ecologist will reassess territories, fence lines and crossing points and advise on replacement / further works to reduce the risk as far as practicable.

7.4.2 For the Protection of QI Alluvial Forest (River Boyne and River Blackwater SAC)

A range of control measures are outlined in **Section 7.4.1**. These measures also have due regard for QI Alluvial forest habitat.

7.4.3 For the Protection of SCI Kingfisher (River Boyne and River Blackwater SPA)

The mitigation at **Section 7.4.1** shall be implemented for QI Mudflats and sandflats, SCI Kingfisher.

7.4.4 For the Protection of SCIs Northern Lapwing and Golden Plover (Boyne Estuary SPA)

The mitigation at **Section 7.4.1** shall be implemented for SCIs Northern Lapwing and Golden Plover.

7.4.5 For the Protection of SCIs Redshank, Shelduck, Oystercatcher, Grey Plover, Knot, Sanderling, Black-tailed Godwit, Turnstone and Little Tern (Boyne Estuary SPA)

The mitigation at **Section 7.4.1** shall be implemented for SCIs Redshank, Shelduck, Oystercatcher, Grey Plover, Knot, Sanderling, Black-tailed Godwit, Turnstone and Little Tern.

7.4.6 For the Protection of SCIs Cormorant, Lesser Black-Backed Gull, Black-Headed Gull and Herring Gull

The mitigation at **Section 7.4.1** shall be implemented for SCIs Cormorant, Lesser Black-Backed Gull, Black-Headed Gull and Herring Gull.

7.4.7 For the Protection of SCIs Cormorant, Lesser Black-Backed Gull, Black-Headed Gull, Herring Gull, Red-Throated Diver, Common Scoter, Common Gull, Great Black-Backed Gull, Common Tern, Arctic Tern, Little Tern, Shag and Little Gull

The mitigation at **Section 7.4.1** shall be implemented for SCIs Cormorant, Lesser Black-Backed Gull, Black-Headed Gull, Herring Gull, Red-Throated Diver, Common Scoter, Common Gull, Great Black-Backed Gull, Common Tern, Arctic Tern, Little Tern, Shag and Little Gull.

8 CONCLUDING STATEMENT

This Natura Impact Statement has considered the potential for effects arising from the Proposed Scheme that would have the potential to adversely affect the integrity of any European site(s), with regard to its qualifying interests, special conservation interests and conservation objectives. The Proposed Scheme crosses over the River Boyne and River Blackwater SAC and the River Boyne and River Blackwater SPA and is upstream of the Boyne Coast and Estuary SAC, the Boyne Estuary SPA and the North-west Irish Sea SPA.

The potential for direct, indirect and cumulative impacts affecting the above designations has therefore been assessed in this NIS. The assessment has been informed by field surveys and specialist reporting with reference to the ecological communities and habitats potentially affected by the Proposed Scheme, in order to provide a scientific basis for evaluations.

From commencement of the project, consideration has been given to avoiding impacts on the European sites through route selection and this is documented in the Route Selection Report prepared for the scheme which is available at http://www.n2slanebypass.ie/ and included as **Appendix 3.1** to the accompanying EIAR. Following Route Selection, efforts have continued to eliminate and reduce potential for adverse effects through design on European sites, and their QI and SCIs. The relevant integrated design measures are presented in **Section 7.1**.

Despite this, the NIS has identified a number of European sites within the ZoI of the Proposed Scheme that may be impacted via the following effect pathways as detailed in **Section 6**:

- Surface water pollution;
- Dispersal of scheduled invasive species;
- Noise emissions;
- Air pollution;
- Artificial lighting; and
- Habitat loss (temporary and permanent).

To mitigate adverse effects on a European site that are likely to arise as a result of the Proposed Scheme, mitigation measure are specified in **Section 7.2 to Section 7.4**. These mitigation measures will be carried out during the construction and operational phases of the Proposed Scheme. With the implementation of mitigation measures, the Proposed Scheme will not result in direct, indirect or cumulative impacts which would have the potential to adversely affect the qualifying interests/special conservation interests of any the European sites assessed within this report having regard to the range, population densities and conservation status of the habitats and species for which these sites are designated (i.e. conservation objectives).

The Proposed Scheme will not, beyond reasonable scientific doubt, adversely affect the integrity of any European Site. No reasonable scientific doubt remains as to the absence of any such adverse effects on the integrity of any European Site from this road development, either individually or in combination with other plans or projects

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Appendix 1 – Natura Impact Statement – Supporting Information

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Appendix 1.1

Ecological Survey for Breeding Birds

Season: 2020, 2021 and 2022

Methodology

Breeding Bird Survey (BBS)

The methodology employed was a scaled down version of the British Trust for Ornithology's (BTO) Common Bird Census (CBC) methodology (Bibby *et al.*, 2000 & Gilbert *et al*., 1998), which aims to capture breeding bird activity within the survey area.

Four visits were made across each breeding season, where the ornithologist slowly walked transects through the survey area, stopping at regular intervals to scan with binoculars and to listen for calls or song. Transects chosen ensured the observer passed within at least 75 m-100 m of all parts of the survey area.

Survey visits were made in the early morning to coincide with the peak period of bird activity and all species seen or heard in the survey area and immediate environs were recorded, including those in flight. Visits were made during favourable weather conditions.

Unless breeding was suspected, the observer did not record Hirundinidae or Swift as they were omnipresent throughout the surveys, particularly in the vicinity of the river where they were in constant flight over this section of the river and its vicinity.

All other species encountered during survey were mapped and coded using standard BTO species codes and activity recorded using the BTO codes for breeding evidence.

Kingfisher Survey

The methodology employed was based on Cummins *et al.*, (2010). This required a competent ornithologist to conduct vantage point watches on two sections of the River Boyne, adjacent to the proposed bridge crossing. Vantage point (VP) locations are illustrated in *Figure 1*. These sections were chosen as they covered both the proposed crossing point of the new by-pass, as well as the historic, known Kingfisher nest site from previous surveys.

Vantage point watches lasted 3 hours and all activity of target species (i.e. Kingfisher), as well as any potential disturbance events, was recorded.

Figure 1. Kingfisher Survey VP locations

Survey Restrictions

Due to travel restrictions as a result of the COVID-19 Pandemic, it was not possible to conduct survey in the early part of the 2020 breeding season. Despite this, a spread of surveys was conducted across the remainder of the season, from late-May to mid-July.

Results

BBS Results

Four, monthly visits were conducted across the breeding season for the purposes of surveying and recording breeding bird activity, and the weather conditions at the time of the surveys are recorded below (see *Table 1, Table 2* and *Table 3*).

Four, monthly visits were made across the breeding season for the purposes of surveying and recording breeding bird activity.

Table 1. BBS dates and weather conditions (2020)

Date	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Temp. (°C)
28-May-20	05h15	09h40	SE2	None	0	>500m	>2km	13°C-17°C
17-Jun-20	04h40	08h55	NW1	Light rain shower (08h10-08h15)	6	>500m	>2km	11°C-14°C
29-Jun-20	04h50	09h20	SW3	Light drizzle showers	8	150-500m	>2km	14°C
13-Jul-20	05h30	09h55	SW2	Light drizzle shower	8	150-500m	>2km	16°C

Table 2. BBS dates and weather conditions (2021)

Date	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Temp. (°C)
22-Apr-21	05h55	10h00	0-SE2	None	0	n/a	>10km	8°C
12-May-21	05h45	09h55	0	Frost	1	>500m	>10km	2°C
09-Jun-21	05h45	09h45	SE3	None	8	150-500m	>10km	15°C
08-Jul-21	06h00	10h00	W1	Light rain showers	8	150-500m	>10km	13°C

Table 3. BBS dates and weather conditions (2022)

Date	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Temp. (°C)
26.04.2022	05h50	09h45	S2	None	4	Unknown	>10km	5°C
31.05.2022	05h30	09h55	NW3	None	3	Unknown	>10km	5°C
21.06.2022	04h30	09h30	WSW2	None	7	Unknown	>10km	11°C
27.07.2022	05h00	10h00	NE2	None	7	Unknown	>10km	8°C

A total of 50 (2020), 51 (2021) and 43 (2022) species were recorded within or in flight over the survey area during breeding bird surveys across the 2020, 2021 and 2022 breeding season, respectively (see *Table 4, Table 5* and *Table 6*). Several species were observed in 2021 that were not observed during surveys in

2020. Ten species which were recorded during the 2021 season were not observed in the 2022 surveys, and two species which were observed in 2022, were not recorded in 2021.

Twenty-six species were observed showing behaviour which led to them being recorded as “probable” or “confirmed” breeding in the 2020 and 2021 surveys. In 2022, 21 species were observed showing behaviour which led them to be classified as ‘’probable’’ or ‘’confirmed’’ breeding. Eight species in 2020, nine species in 2021 and six species in 2022 were considered to be species of conservation concern.

Approximate breeding locations of species of conservation concern which were confirmed breeding are illustrated in *Figure 2*.

Table 4. BBS results (2020).

Species	Visit 1 05-Dec-19	Visit 2 18-Dec-19	Visit 3 07-Dec-20	Visit 4 18-Feb-20	Highest breeding evidence	Breeding status	Conservation status
Blackbird	12	16	17	27	Recently fledged young	Confirmed	
Blackcap	2	2	3	3	Territory held	Probable	
Black-headed gull	0	0	0	2	Flying over	Non-breeding	Red (B)
Blue tit	3	20	10	20	Recently fledged young	Confirmed	
Bullfinch	2	1	2	0	Suitable habitat	Possible	
Buzzard	1	1	3	1	Suitable habitat	Possible	WA
Chaffinch	8	14	14	20	Recently fledged young	Confirmed	
Chiffchaff	2	2	1	0	Territory held	Probable	
Coal tit	0	1	0	1	Suitable habitat	Possible	
Collared dove	2	2	7	4	Suitable habitat	Possible	
Coot	1	1	2	0	Suitable habitat	Possible	Amber (B/W)
Cormorant	1	0	0	1	Summering	Non-breeding	Amber (B/W)
Dunnock	7	11	15	12	Recently fledged young	Confirmed	
Goldcrest	2	1	0	0	Territory held	Probable	Amber (B)
Goldfinch	0	6	16	15	Recently fledged young	Confirmed	
Great tit	2	4	8	16	Recently fledged young	Confirmed	
Greenfinch	0	0	2	3	Suitable habitat	Possible	Amber (B)
Grey heron	2	1	0	1	Suitable habitat	Possible	
Grey wagtail	1	0	2	0	Suitable habitat	Possible	Red (B)
Herring gull	0	2	0	0	Flying over	Non-breeding	Red (B)
Hooded crow	2	2	6	3	Suitable habitat	Possible	
House sparrow	20	9	25	19	Probable nest site	Probable	Amber (B)
Jackdaw	2	2	11	24	Recently fledged young	Confirmed	
Jay	0	0	1	0	Suitable habitat	Possible	
Kestrel	0	1	1	0	Suitable habitat	Possible	WA; Amber (B)
Kingfisher	0	1	0	0	Suitable habitat	Possible	Annex 1, Amber (B)
Linnet	4	1	0	9	Pair present	Probable	Amber (B)

Species	Visit 1 05-Dec-19	Visit 2 18-Dec-19	Visit 3 07-Dec-20	Visit 4 18-Feb-20	Highest breeding evidence	Breeding status	Conservation status
Little egret	0	1	1	0	Suitable habitat	Possible	Annex 1
Long-tailed tit	0	2	0	4	Suitable habitat	Possible	
Magpie	2	4	2	5	Agitated behaviour	Probable	
Mallard	0	7	1	9	Recently fledged young	Confirmed	
Meadow pipit	2	4	3	5	Singing male	Possible	Red (B)
Mistle thrush	2	1	2	0	Agitated behaviour	Probable	Amber (B)
Moorhen	0	1	0	0	Suitable habitat	Possible	
Mute swan	2	2	6	6	Recently fledged young	Confirmed	Amber (B/W)
Pheasant	0	0	3	0	Pair present	Probable	
Pied wagtail	3	4	4	11	Suitable habitat	Possible	
Robin	13	11	5	20	Recently fledged young	Confirmed	Amber (B)
Rook	22	6	12	70	Recently fledged young	Confirmed	
Sedge warbler	3	2	2	2	Territory held	Probable	
Song thrush	2	0	2	3	Agitated behaviour	Probable	
Sparrowhawk	0	0	0	1	Suitable habitat	Possible	WA; Amber (B)
Spotted flycatcher	0	0	1	1	Suitable habitat	Possible	Amber (B)
Starling	4	3	15	15	Carrying food	Confirmed	Amber (B)
Treecreeper	1	1	1	1	Territory held	Probable	
Water rail	0	1	0	0	Agitated behaviour	Probable	Amber (B)
Whitethroat	0	1	0	0	Singing male	Possible	
Willow warbler	4	7	4	4	Territory held	Probable	
Woodpigeon	17	10	17	32	Suitable habitat	Possible	
Wren	8	8	9	10	Recently fledged young	Confirmed	

Key to Table 4

Annex 1 – Listed on Annex 1 of the EU Birds Directive

WA – Listed on Part 1 of the Fourth Schedule of the Wildlife Act, 1976

Red – Red listed BoCCI species

Amber – Amber listed BoCCI species

B – BoCCI listed due to breeding population

W – BoCCI listed due to wintering population

Bold – Species of conservation concern recorded as “probable” or “confirmed” breeding

Table 5. BBS results (2021)

Species	Visit 1 22-Apr-21	Visit 2 12-May-21	Visit 3 09-Jun-21	Visit 4 08-Jul-21	Highest breeding evidence	Breeding status	Conservation status
Blackbird	22	22	13	9	Carrying food	Confirmed	Green
Blackcap	11	8	9	1	Territory held	Probable	Green
Blue tit	3	4	2	1	Habitat	Possible	Green
Bullfinch	2	2	1	2	Pair	Probable	Green
Buzzard	1	1	0	1	Habitat	Possible	Green
Chaffinch	10	16	10	9	Pair	Probable	Green

NIS APPENDIX 1

Species	Visit 1 22-Apr-21	Visit 2 12-May-21	Visit 3 09-Jun-21	Visit 4 08-Jul-21	Highest breeding evidence	Breeding status	Conservation status
Chiffchaff	3	4	2	2	Territory held	Probable	Green
Coal tit	3	4	0	0	Carrying food	Confirmed	Green
Collared dove	2	0	0	0	Habitat	Possible	Green
Cormorant	1	0	1	0	Flying over	Non-breeding	Amber [B/W]
Curlew	0	0	0	5	Flying over	Non-breeding	Red [B/W]
Dunnock	14	11	4	5	Territory held	Probable	Green
Feral pigeon	0	27	0	28	Suitable habitat	Possible	n/a
Goldcrest	14	6	6	4	Territory held	Probable	Amber [B]
Goldfinch	6	8	1	9	Habitat	Possible	Green
Great black-backed gull	0	2	0	0	Flying over	Non-breeding	Green
Great tit	6	3	0	0	Singing male	Possible	Green
Greenfinch	2	2	3	1	Singing male	Possible	Amber [B]
Grey heron	2	2	0	0	Flying over	Non-breeding	Green
Herring gull	13	0	2	1	Summering	Non-breeding	Amber [B/W]
Hooded crow	6	6	1	6	Habitat	Possible	Green
House martin	0	1	4	5	Habitat	Possible	Amber [B]
House sparrow	14	12	14	7	Carrying food	Confirmed	Amber [B]
Jackdaw	29	29	44	12	Visiting probable nest site	Probable	Green
Lesser black-backed gull	2	1	0	1	Summering	Non-breeding	Amber [B/W]
Linnet	2	3	0	0	Pair	Probable	Amber [B]
Magpie	4	2	4	4	Habitat	Possible	Green
Mallard	3	0	2	2	Pair	Probable	Amber [B/W]
Meadow pipit	2	2	1	1	Displaying	Probable	Red [B]
Mistle thrush	1	3	3	0	Singing male	Possible	Green
Moorhen	1	0	0	0	Habitat	Possible	Green
Mute swan	0	1	0	0	Occupied nest	Confirmed	Amber [B/W]
Peregrine	0	1	0	0	Flying over	Non-breeding	A1, WA, Green
Pheasant	3	1	3	0	Pair	Probable	n/a
Pied wagtail	1	1	1	1	Carrying food	Confirmed	Green
Raven	1	2	0	0	Flying over	Non-breeding	Green
Reed bunting	2	0	1	4	Carrying food	Confirmed	Green
Robin	12	16	6	3	Territory held	Probable	Green
Rook	47	45	102	60	Recently fledged young	Confirmed	Green
Sand martin	0	5	0	0	Summering	Non-breeding	Amber [B]
Sedge warbler	2	4	1	0	Territory held	Probable	Green
Song thrush	4	2	2	0	Carrying food	Confirmed	Green

Species	Visit 1 22-Apr-21	Visit 2 12-May-21	Visit 3 09-Jun-21	Visit 4 08-Jul-21	Highest breeding evidence	Breeding status	Conservation status
Spotted flycatcher	0	1	0	0	Singing male	Possible	Amber [B]
Starling	11	18	39	10	Nest with young	Confirmed	Amber [B]
Stock dove	0	0	0	1	Suitable habitat	Possible	Red [B]
Swallow	3	12	9	12	Habitat	Possible	Amber [B]
Swift	0	6	3	2	Summering	Non-breeding	Red [B]
Willow warbler	4	1	0	0	Singing male	Possible	Amber [B]
Woodpigeon	36	34	43	17	Visiting probable nest site	Probable	Green
Wren	30	30	23	23	Agitated behaviour	Probable	Green
Yellowhammer	11	20	15	11	Pair	Probable	Red [B]

Key to Table 5

A1 – Listed on Annex 1 of the EU Birds Directive

WA – Listed on Part 1 of the Fourth Schedule of the Wildlife Act, 1976

Red – Red listed BoCCI species

Amber – Amber listed BoCCI species

B – BoCCI listed due to breeding population

W – BoCCI listed due to wintering population

Bold – Species of conservation concern recorded as “probable” or “confirmed” breeding

Table 6. BBS results (2022)

Species	Visit 1 26-Apr-22	Visit 2 31-May-22	Visit 3 21-Jun-22	Visit 4 27-Jul-22	Highest breeding evidence	Breeding status	Conservation status
Blackbird	12	17	14	10	Pair present	Probable	Green
Blackcap	3	8	5	1	Recently fledged young	Confirmed	Green
Blue tit	2	2	1	4	Recently fledged young	Confirmed	Green
Buzzard	0	1	1	1	Territory held	Probable	WA
Chaffinch	3	7	13	4	Carrying food	Confirmed	Green
Chiffchaff	3	3	2	0	Territory held	Probable	Green
Coal tit	1	4	0	1	Recently fledged young	Confirmed	Green
Collared dove	1	0	0	1	Singing male	Possible	Green
Curlew	0	0	0	1	Summering	Non-breeding	Red [B/W]
Dunnock	4	10	0	0	Territory held	Probable	Green
Goldcrest	2	3	1	13	Territory held	Probable	Amber [B]
Goldfinch	0	10	13	20	In suitable habitat	Possible	Green
Great tit	0	4	0	5	Recently fledged young	Confirmed	Green
Grey heron	1	1	0	0	Flying over	Non-breeding	Green
Hooded crow	0	7	9	7	In suitable habitat	Possible	Green
House martin	0	5	0	6	Recently fledged young	Confirmed	Amber [B]
House sparrow	1	7	4	0	Recently fledged young	Confirmed	Amber [B]

Species	Visit 1 26-Apr-22	Visit 2 31-May-22	Visit 3 21-Jun-22	Visit 4 27-Jul-22	Highest breeding evidence	Breeding status	Conservation status
Jackdaw	4	25	28	31	Recently fledged young	Confirmed	Green
Lesser black-backed gull	0	2	4	2	Flying over	Non-breeding	Amber [B/W]
Lesser redpoll	0	0	1	0	Singing male	Possible	Green
Linnet	0	6	0	0	In suitable habitat	Possible	Amber [B]
Magpie	2	5	6	5	In suitable habitat	Possible	Green
Meadow pipit	0	1	0	0	In suitable habitat	Possible	Red [B]
Mistle thrush	0	1	0	0	Singing male	Possible	Green
Mute swan	2	0	1	0	In suitable habitat	Possible	Amber [B/W]
Pheasant	1	0	1	7	In suitable habitat	Possible	Green
Pied wagtail	0	4	0	0	In suitable habitat	Possible	Green
Raven	0	0	0	1	Flying over	Non-breeding	Green
Reed bunting	1	1	0	0	Territory held	Probable	Green
Robin	12	10	19	25	Agitated behaviour	Probable	Green
Rook	0	61	49	153	Recently fledged young	Confirmed	Green
Sand martin	0	1	0	0	Summering	Non-breeding	Amber [B]
Sedge warbler	0	1	0	0	Singing male	Possible	Green
Song thrush	2	4	4	1	Carrying food	Confirmed	Green
Starling	2	12	26	32	In suitable habitat	Possible	Amber [B]
Stock dove	0	1	0	0	Flying over	Non-breeding	Red [B]
Swallow	0	8	4	6	In suitable habitat	Possible	Amber [B]
Swift	0	0	5	0	Summering	Non-breeding	Amber [B]
Treecreeper	0	0	1	0	In suitable habitat	Possible	Green
Willow warbler	6	2	1	2	In suitable habitat	Possible	Amber [B]
Woodpigeon	8	45	23	45	Territory held	Probable	Green
Wren	14	32	44	41	Recently fledged young	Confirmed	Green
Yellowhammer	3	16	11	16	Pair present	Probable	Red [B]

Key to Table 6

A1 – Listed on Annex 1 of the EU Birds Directive

WA – Listed on Part 1 of the Fourth Schedule of the Wildlife Act, 1976

Red – Red listed BoCCI species

Amber – Amber listed BoCCI species

B – BoCCI listed due to breeding population

W – BoCCI listed due to wintering population

Bold – Species of conservation concern recorded as “probable” or “confirmed” breeding

Kingfisher Survey Results

Four visits were carried out across the 2020 and 2021 breeding season, and five visits were carried out across the 2022 breeding season for the purposes of surveying for breeding kingfisher. Survey dates ranged from late-May to mid-July in 2020, from late-March to early-June in 2021 and from late-April to early-July in 2022 (see *Table 7, Table 8* and *Table 9*) and surveys were conducted in favourable conditions.

Table 7. Kingfisher survey dates and weather conditions (2020)

Date	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Temp. (°C)
29-May-20	06h40	12h40	SE1	None	1	>500m	>5km	14°C-20°C
18-Jun-20	07h30	13h30	N2	None	7	150-500m	>5km	13°C-16°C
30-Jun-20	05h20	11h20	SW2	None	6	>500m	>5km	12°C-17°C
14-Jul-20	06h40	12h40	NW3	Heavy thunder showers, late morning	8	150-500m	>5km	12°C

Table 8. Kingfisher survey dates and weather conditions (2021)

Date	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Temp. (°C)
30-Mar-21	10h30	16h30	SW4	None	4	>500m	>10km	11°C
22-Apr-21	10h30	16h30	SE3	None	4	150-500m	>10km	11°C
12-May-21	10h30	16h30	SE3	None	6	>500m	>10km	10°C-12°C
09-Jun-21	10h30	16h30	SE3-SW3	Light rain showers	8	150-500m	>5km	19°C

In addition to recording weather conditions, the surveyor also noted potential disturbance events observed during survey. These are presented in Table 7 and 8 below:

Table 9. Kingfisher survey dates and weather conditions (2022)

Date	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Temp. (°C)
24-Apr-22	09h05	15h00	NW4	None	0	unknown	>5km	10°C
19-May-22	14h15	20h00	NW3	None	5	unknown	>5km	19°C
04-Jun-22	15h50	20h05	ENE4	None	6	unknown	5-10km	14°C
28-Jun-22	07h40	12h45	SSE3	Light rain	8	unknown	>5km	13°C
09-Jul-22	08h50	13h30	NW3	None	8	unknown	>5km	17°C

In addition to recording weather conditions, the surveyor also noted potential disturbance events observed during the 2020 and 2021 surveys. These are presented in *Table 10* and *Table 11* below:

Table 10. Disturbance events recorded during Kingfisher surveys (2020)

Date	Start	End	Walkers	Dogs	Anglers	Powered boats	Unpowered boats	Aircraft
29-May-20	06h40	12h40	7	8	4	0	0	0
18-Jun-20	07h30	13h30	9	4	1	0	8	0
30-Jun-20	05h20	11h20	13	11	3	0	18	0
14-Jul-20	06h40	12h40	4	3	1	0	2	0

Table 11. Disturbance events recorded during Kingfisher surveys (2021)

Date	Start	End	Walkers	Dogs	Anglers	Unpowered boats
30-Mar-21	10h30	16h30	49	9	0	0
22-Apr-21	10h30	16h30	38	7	1	0
12-May-21	10h30	16h30	6	4	0	0
09-Jun-21	10h30	16h30	15	7	0	6

Multiple sightings of Kingfisher were observed on each survey in 2020, with a juvenile recorded on 30th June survey. Results are presented in *Table 12* below, which confirmed the location of the nest to be at the same site as previous years (*Figure 3*).

Despite making visits across the season, no observations of kingfisher were made during the 2021 season in either dedicated kingfisher survey, breeding bird survey or casual observations. Additional anecdotal evidence from a number of locals who regularly walk the river and the group leader of a kayak group, who was on his fourth journey down the Boyne from to Stackallen to Slane in two weeks, there have been no sightings of kingfisher in the Slane area in 2021.

In the 2022 kingfisher surveys, a total of 12 flights were recorded and are presented in *Table 13* below. Where the sex of the species could be determined, all records were of adult males. Whilst there was no confirmation of breeding, a territory was held across the season at Slane Demesne, approximately 125 m upstream from the 2020 breeding site.

Table 12. Results of Kingfisher Survey (2020)

Date	Time of observation	Observation	Note
29-May-20	07h28	1 Adult	Flew from north bank
29-May-20	08h07	1 Adult	Flew up river to north bank
29-May-20	08h10	1 Adult	
29-May-20	09h23	1 Adult	Flew into tree cover, north bank
29-May-20	09h25	1 Adult	Flew up river to north bank
18-Jun-20	09h01	1 Adult	Flew down river, calling
18-Jun-20	09h38	1 Adult	Flew up river, carrying fish, lost sight as flew under bridge
18-Jun-20	10h51	1 Adult	Flew out from north bank
18-Jun-20	11h09	1 Adult	Flew into north bank, carrying fish
18-Jun-20	11h13	1 Adult	Flew into tree cover, north bank
18-Jun-20	13h07	1 Adult	Carrying fish
30-Jun-20	05h17	1 Adult	Flushed on approach to VP
30-Jun-20	08h01	1 Adult	Flew into tree cover, north bank
30-Jun-20	08h03	1 Adult	Flew out from north bank
30-Jun-20	08h30	1 Juvenile	Perched
30-Jun-20	08h34	1 Juvenile	Flew from perch, downstream
30-Jun-20	10h48	1 Adult	Flew downstream
14-Jul-20	07h24	1 Adult	Upstream, under bridge
14-Jul-20	09h08	1 Juvenile(?)	Looked like juvenile bird but only had brief view
14-Jul-20	09h47	1 Adult	Flushed on approach to VP
14-Jul-20	10h41	1 Adult	Flew from north bank
14-Jul-20	11h05	1 Adult	Carrying fish
14-Jul-20	11h07	1 Adult	Flew from north bank

Date	Time of observation	Observation	Note
14-Jul-20	11h42	1 Adult	Flew into cover with fish
14-Jul-20	11h50	1 Adult	Flew from bank

Table 13. Results of Kingfisher Survey (2022)

Date	Time of observation	Observation	Note
24-Apr-22	09h27	1 Adult	Flew downstream at weir by Slane Castle
24-Apr-22	09h46	1 Adult	Upstream towards Slane Castle, lost sight round bend in river
24-Apr-22	11h09	1 Adult	Bird flying downstream over weir and under existing road bridge
24-Apr-22	11h16	1 Adult	Presumably, same bird at 11h09 flying upstream from existing road bridge and over weir
24-Apr-22	14h40	1 Adult	Bird recorded flying downstream, approx. 500m downstream of proposed crossing
19-May-22	17h43	1 Adult	Upstream between weirs
19-May-22	17h46	1 Adult	Presumably, same bird returning downstream between weirs
04-Jun-22	17h25	1 Adult	Downstream, lost sight as bird flew under existing road bridge
28-Jun-22	11h33	1 Adult	Bird flew upstream towards Slane Castle
28-Jun-22	12h11	1 Adult	Bird flew upstream towards Slane Castle
28-Jun-22	12h30	1 Adult	Bird flew downstream from Slane Castle direction
09-Jul-22	09h49	1 Adult	Bird flew upstream towards Slane Castle

Figure 2. Approx. Breeding Locations of Species Conservation Concern Confirmed Breeding.

Appendix 1.2

Ecological Surveying for Winter Birds

Season: 2019/20, 2020/21 and 2021/22

Methodology

Vantage Point Survey

In the absence of guidance on vantage point (VP) survey protocols for the Republic of Ireland, guidance developed by Scottish Natural Heritage (SNH) for onshore wind farm ornithology surveys was followed (SNH, 2017).

Surveys to record movements of waterfowl during the 2019/20,2020/21 and 2021/2022 winter seasons were conducted from two vantage points (as illustrated on *Figure 3*) overlooking the proposed crossing point:

- Hill of Slane [Grid ref: IN961751]; and
- Slane Valley [Grid ref: IN975728].

The protocol followed during surveys was a systematic 180° scan (including overhead) for birds in flight.

The primary target species were geese, swans, waders and Annex 1 raptors, with secondary target species being ducks, cormorants, herons and all other and birds of prey.

Surveys were not undertaken in unfavourable weather conditions. Data collected for each observation included:

- Time of observation
- Species
- Flock size
- Flight height, using bands (1 = 0-20 m, 2 = 20-100 m, 3 = 100-300 m)
- Flight direction
- Flight-lines drawn onto maps, which were later digitised in GIS (primary target species only)

During the 2019/20 survey period, a total of 22 vantage point surveys were undertaken between November 2019 and March 2020, 11 at VP1 – Hill of Slane and 11 at VP2 – Slane Valley. During the 2020/21 survey period, a total of 24 vantage point surveys were undertaken between November 2020 and March 2021, 12 at VP1 – Hill of Slane and 12 at VP2 – Slane Valley. For the 2021/2022 survey period, surveys did not begin until late December 2021 due to timing of appointment. During the 2021/2022 survey period, a total of 16 vantage point surveys were undertaken between December 2021 and March 2022, eight at VP1 – Hill of Slane and eight at VP2 – Slane Valley.

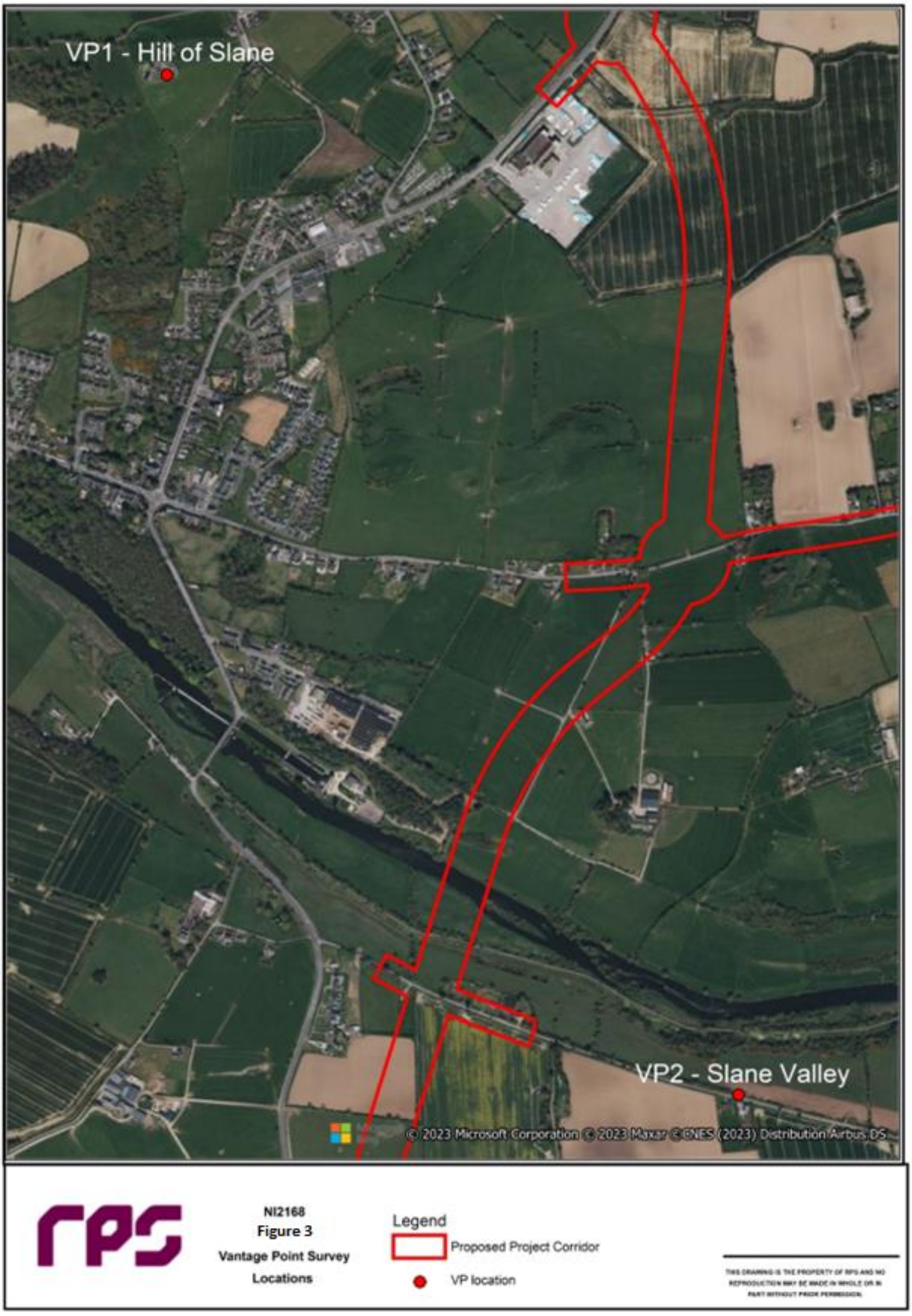

Figure 3. Vantage Point Survey Locations.

Wintering Farmland Bird Survey

Wintering bird surveys along the preferred route were conducted across the winter season 2019-2020, 2020-2021 and 2021-2022.

The methodology employed was based on the BTO's CBC technique (Bibby *et al.,* 2000 & Gilbert *et al.,* 1998), which aims to capture overwintering bird activity within a site.

This required a competent ornithologist to slowly walk transects through a site, or along a route, recording all birds seen or heard. Species encountered were mapped and recorded using standard BTO species codes. Transects chosen ensured the observer passed all parts of the proposed corridor.

Overwintering Wildfowl Survey

In addition to conducting wintering bird surveys, surveys specific for overwintering wildfowl were conducted across the winter season 2019-2020, 2020-2021 and 2021-2022.

The methodology employed was based on the BTO's wetland bird survey (WeBS) and BirdWatch Ireland's I-WeBS Core Counts which use the so-called 'look-see' method (Bibby *et al*., 2000 and BirdWatch Ireland), whereby the observer, familiar with the species involved, surveys the whole of a predefined area. The survey area, for the purposes of this study, included lands within a 2 km buffer of the proposed by-pass route (*Figure 4*).

Counts were made at all wetland habitats within the surveys area including lakes, ponds, rivers and streams. Numbers of all waterbird species, as defined by Wetlands International (Rose and Scott, 1997), were recorded. Target species for the purposes of this survey includes divers, grebes, cormorants, herons, swans, geese, ducks, rails, cranes, waders and Kingfisher. Gulls, which are optional in WeBS counts, and cormorants were also noted but are not presented in the results.

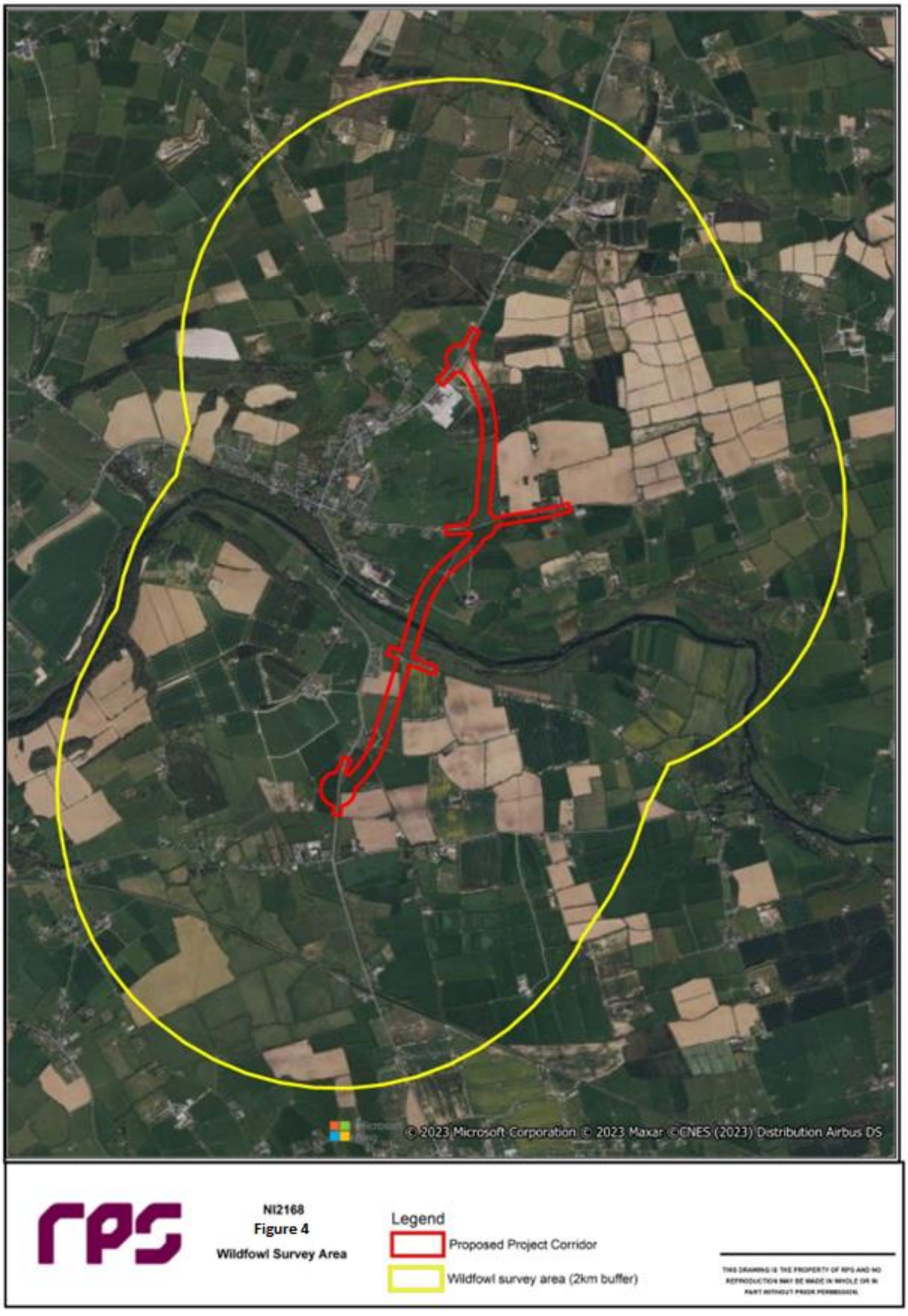

Figure 4: Wildfowl Survey Area (2km Buffer)

Results

Vantage Point Survey Results

A total of 66 survey hours were conducted between late-November 2019 and mid-March 2020 (see *Table 14*), with 13 target species' flights recorded.

A total of 72 survey hours were conducted between November 2020 and March 2021 (see *Table 15*), with 40 target species' observations recorded.

A total of 48 survey hours were conducted between December 2021 and March 2022 (see *Table 16*), with six target species' observations recorded.

Table 14. VP survey dates and weather conditions (2019/2020)

Date	VP	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Frost	Temp. (°C)
26.11.2019	VP2	09:30	12:30	E5	Light showers	8	<150m	Moderate (1-2km)	None	9°C
26.11.2019	VP1	13:00	16:00	SE4	Light showers	8	150m-500m	Good (>2km)	None	12°C
27.11.2019	VP1	08:10	11:10	NE2	Light showers	8	<150m	Moderate (1-2km)	None	10°C
27.11.2019	VP1	11:40	14:40	NE2	Light showers	7	150m-500m	Good (>2km)	None	10°C
27.11.2019	VP2	08:10	11:10	NE2	Light showers	8	<150m	Moderate (1-2km)	None	10°C
27.11.2019	VP2	11:40	14:40	NE2	Light showers	7	150m-500m	Good (>2km)	None	10°C
09.12.2019	VP1	09:05	12:05	NW4-NW3	None	3	>500m	Good (>2km)	None	6°C
09.12.2019	VP1	12:35	15:35	NW3-NW2	None	3	>500m	Good (>2km)	None	6°C
13.12.2019	VP2	08:05	11:05	W4-W5	None	5	>500m	Good (>2km)	None	2/3°C
13.12.2019	VP2	11:35	14:35	W4-W3	Light showers	5	>500m	Good (>2km)	None	3°C
08.01.2020	VP1	09:00	12:00	WSW3	Light showers	8	>500m	Good (>2km)	None	7°C
08.01.2020	VP2	12:30	15:30	WSW3	None	8	>500m	Good (>2km)	None	7°C
30.01.2020	VP2	08:25	11:25	SW4	None	5	>500m	Good (>2km)	None	11°C
30.01.2020	VP1	12:00	15:00	SW3	None	6	>500m	Good (>2km)	None	10°C
03.02.2020	VP1	13:00	16:00	W3	None	7	150m-500m	Good (>2km)	None	7°C
03.02.2020	VP2	09:30	12:30	WSW3	None	7	150m-500m	Good (>2km)	None	6°C
13.02.2020	VP1	12:00	15:00	W3	None	5	150m-500m	Good (>2km)	None	4°C
13.02.2020	VP2	08:30	11:30	NW4	None	5	150m-500m	Good (>2km)	None	4°C
03.03.2020	VP1	13:00	16:00	E3	Light showers	8	150m-500m	Good (>2km)	None	5°C - 2°C
03.03.2020	VP2	08:20	11:20	SSW2	Light showers	8	150m-500m	Good (>2km)	None	7°C
16.03.2020	VP1	09:15	12:15	SW4	Light showers	8	150m-500m	Good (>2km)	None	8°C
16.03.2020	VP2	13:00	16:00	WSW4	Light showers	8	150m-500m	Good (>2km)	None	8°C

Table 15. VP survey dates and weather conditions (2020/2021)

Date	VP	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Frost	Temp. (°C)
03.11.2020	VP2	08h25	11h25	WSW3	None	7	150-500m	>2km	None	6°C
03.11.2020	VP1	12h05	15h05	WSW3	None	6	150-500m	>2km	None	9°C
06.11.2020	VP1	07h10	10h10	SE1-SE2	None	8 - 1	>500m	>15km	None	8°C
06.11.2020	VP2	10h40	13h40	SE2	None	1	>500m	>15km	None	11°C
20.11.2020	VP2	07h33	10h33	SW3	Drizzle for first half of survey	8	<500m	1km	None	9°C
20.11.2020	VP2	11h03	14h03	SW3	Light rain shower	8	<500m	1-3km	None	11°C
24.11.2020	VP1	09h30	12h30	SSW2	None	7	150-500m	>2km	None	11°C
24.11.2020	VP1	13h00	16h00	S2	None	6	150-500m	>2km	None	11°C
15.12.2020	VP1	10h00	13h00	SE2-3	None	7	>500m	>10km	None	5°C
15.12.2020	VP2	13h30	16h30	SW3	None	7	>500m	>10km	None	8°C
18.12.2020	VP2	08h50	11h50	SE2	None	5	150-500m	>2km	None	7°C
18.12.2020	VP1	12h35	15h35	SSE3	None	6	150-500m	>2km	None	10°C
20.01.2021	VP2	09h30	12h30	W2	None	8	150-500m	>5km	None	4°C
20.01.2021	VP1	13h00	16h00	NNW2	None	8	150-500m	>5km	None	2°C
30.01.2021	VP2	08h35	11h35	ENE3	None	8	150-500m	>2km	None	3°C
30.01.2021	VP1	12h15	15h15	ENE4	Light showers	7	150-500m	>2km	None	4°C
03.02.2021	VP2	07h40	10h40	3	Light rain shower	8	150-500m	>5km	None	6°C
03.02.2021	VP2	11h10	14h10	3	None	7	150-500m	>5km	None	6°C
17.02.2021	VP1	09h15	12h15	SW4	Light showers	3	150-500m	>2km	None	6°C
17.02.2021	VP1	12h45	15h45	S4	Light showers	4	150-500m	>2km	None	7°C
05.03.2021	VP2	06h40	09h40	ESE3	None	8	>500m	>10km	None	4°C
05.03.2021	VP1	10h10	13h10	ESE3	None	8	>500m	>10km	None	4°C
20.03.2021	VP1	06h05	09h05	W2	None	3	>500m	>2km	None	9°C
20.03.2021	VP2	09h35	12h35	WNW3	None	2	>500m	>2km	None	12°C

Table 16. VP survey dates and weather conditions (2021/2022)

Date	VP	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Frost	Temp. (°C)
23.12.2021	VP1	08h45	11h45	S1-3	Light showers	8	unk	>2km	None	8°C
23.12.2021	VP2	12h15	15h15	SSE2	None	8	unk	>2km	None	8°C
27.12.2021	VP2	08h40	11h40	NE2	None	8	unk	>2km	None	
27.12.2021	VP1	13h35	16h35	NE2	None	8	unk	>2km	None	
04.01.2022	VP2	13h45	16h45	NW3	None	2	unk	>2km	None	4°C
05.01.2022	VP1	11h15	14h15	W3	Light showers	8	unk	1-2km	None	
18.01.2022	VP2	09h00	12h00	SW2	None	2	unk	>2km	None	5°C
19.01.2022	VP1	09h40	12h40	W3	None	8	unk	>2km	None	7°C
08.02.2022	VP1	12h05	15h05	SW3	Drizzle at start	4	unk	>2km	None	

Date	VP	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Frost	Temp. (°C)
10.02.2022	VP2	08h00	11h00	NW4	None	6	unk	>2km	Ground frost at start	4°C
21.02.2022	VP1	08h15	11h15	W5	None	6	unk	>2km	None	8°C
27.02.2022	VP2	15h00	16h00	S4	None	3	unk	>2km	None	10°C
04.03.2022	VP2	08h40	11h40	W4	None	4	unk	>2km	None	
08.03.2022	VP1	09h45	12h45	SE5	Light showers	5	unk	1-2km	None	
24.03.2022	VP1	16h00	19h00	N3	None	0	unk	>2km	None	
25.03.2022	VP2	16h00	19h00	E4	None	0	unk	>2km	None	

13 flights of five target species were recorded during the 2019/20 vantage point surveys (see *Figure 17*). Forty records of seven target species were observed during the 2020/21 vantage point surveys (see *Table 18).* Four records of one target species were observed during the 2021/2022 vantage point surveys (see *Table 19*).

Table 17. Target species recorded during Vantage Point Surveys (2019/2020)

Date	VP	Species	Flock size	Time first recorded	Height	Direction of flight	Note
26.11.2019	VP2	Peregrine	1	1004	20-100m	W	Flew west between VP and river
26.11.2019	VP2	Curlew	1	1156	20-100m	E	Flew downstream
26.11.2019	VP1	Curlew	1	14:43	>100m	SW	Flew SW high over VP
27.11.2019	VP2	Lapwing	8	13:45	20-100m	S	Flew south, AGL 40m
08.01.2020	VP1	Lapwing	26	10:24	20-100m	WSW	Flock flew WSW over Boyne and beyond
08.01.2020	VP2	Mute Swan	2	14:02	0-20m	E	Flew down river, appeared to be landing on Boyne
30.01.2020	VP2	Mute Swan	2	10:09	0-20m	WNW	Flew west, 15m AGL over bridge and low over weir, appeared to be landing on Boyne
13.02.2020	VP1	Mute Swan	5	13:17	<20m	W	2AD, 3 IMM, flew west from Knowth area, upstream towards bridge
13.02.2020	VP1	Golden Plover	12	14:36	20-100m	NNE	Flew NNE over valley and Norris Hill 80-150m AGL
03.03.2020	VP1	Lapwing	22	14:42	20-100m	NNW	40m AGL
03.03.2020	VP1	Mute Swan	2	15:01	<20m	ESE	Up valley, appeared to land near tow path
16.03.2020	VP1	Curlew	2	09:35	<20m	NNE	Over Boyne Valley and Norris Hill, calling
16.03.2020	VP1	Golden Plover	8	11:41	20-100m	NNE	40-60m AGL

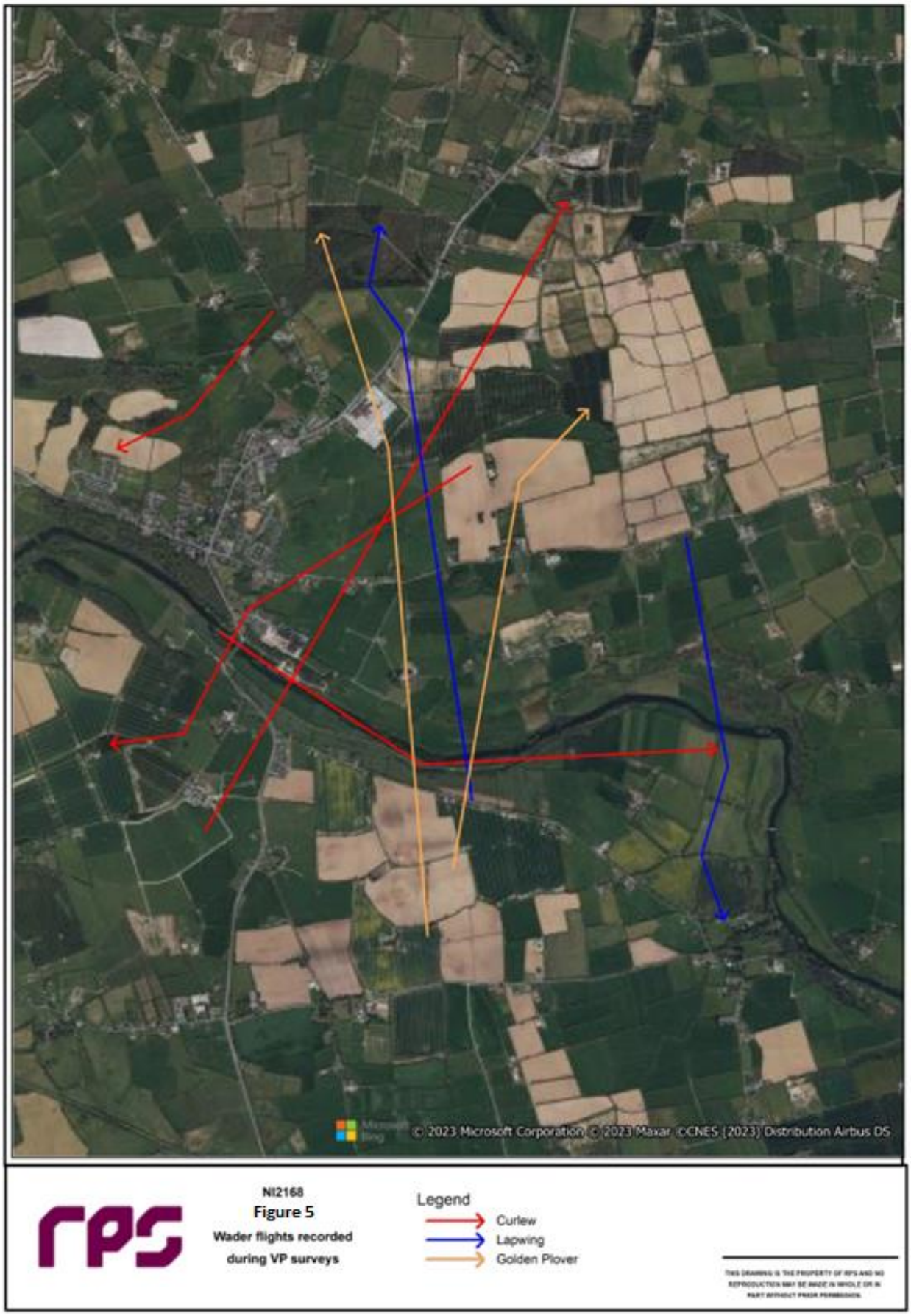

Figure 5: Wader Flights recorded during 2019/2020 VP Surveys

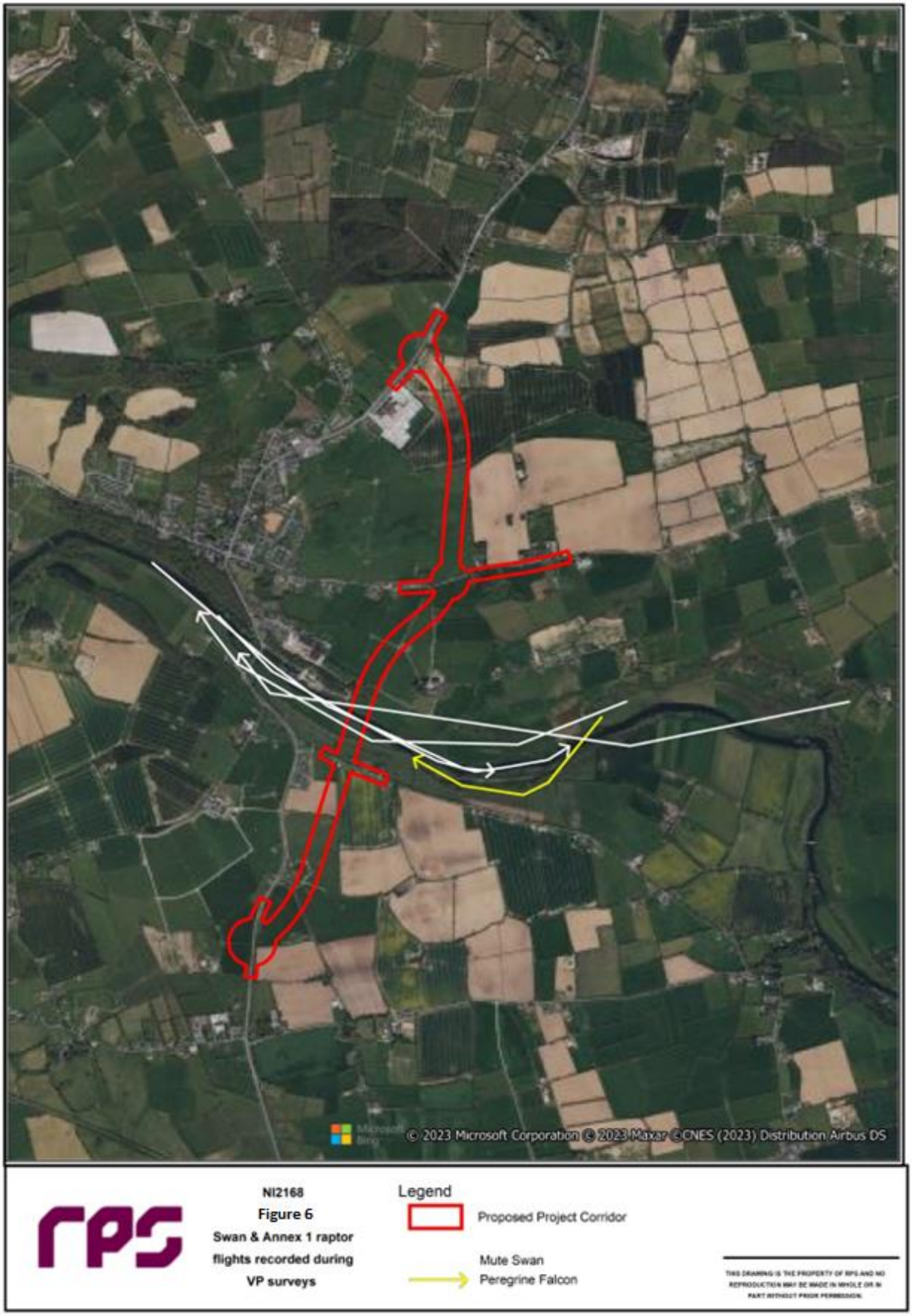

Figure 6: Swan & Annex 1 raptor flights recorded during 2019/2020 VP surveys

Table 18. Target species recorded during Vantage Point Surveys (2020/2021)

Date	VP	Species	Flock size	Time first recorded	Height	Direction of flight	Note
03.11.2020	VP1	Lapwing	8	12h12	20-100m	SSE	Flew SSE from south of river towards McGrudders Cross
20.11.2020	VP2	Mute swan	4	08h07	20-100m	West	2 A / 2 J, landed on river at approx. proposed crossing point
20.11.2020	VP2	Mute swan	4	09h08			Bird seen at 0807, now feeding in field
20.11.2020	VP2	Curlew	9	09h19	20-100m	West	Turned between new crossing and current bridge and headed south
20.11.2020	VP2	Lapwing	8	09h27	>100m	West	
20.11.2020	VP2	Whooper swan	4	09h29	>100m	West	
20.11.2020	VP2	Greenshank	1	10h17	>100m	East, over VP	
20.11.2020	VP2	Curlew	3	12h09	>100m	East	
24.11.2020	VP1	Mute swan	2	13h41	<20m	West	2 Ad upstream
24.11.2020	VP1	Curlew	12	14h26	20-100m	East	Flock heading SSW over Norris Hill, heading towards McGrudders Cross
24.11.2020	VP1	Lapwing	6	14h26	20-100m	East	
15.12.2020	VP2	Curlew	82				Roosting in field on northern bank at proposed crossing point
15.12.2020	VP2	Lapwing	1				
15.12.2020	VP2	Curlew	13	14h22	20-100m	West	Turned between new crossing and current bridge and headed south
15.12.2020	VP2	Curlew	119	15h13	20-100m	East	
15.12.2020	VP2	Curlew	5	15h41	>100m	East	
18.12.2020	VP1	Lapwing	12	13h12	20-100m	SE	Towards McGrudders Cross
18.12.2020	VP1	Curlew	9	13h12	20-100m	SE	
18.12.2020	VP1	Mute swan	4	14h24	<20m	East	Downstream
18.12.2020	VP2	Curlew	4	09h07	<20m	SW	Towards McGrudders Cross
18.12.2020	VP2	Mute swan	5	10h35	<20m	East	
20.01.2021	VP2	Mute swan	4	09h33			2A/2J on field opposite VP
20.01.2021	VP2	Mute swan	4	10h31	<20m	West	
20.01.2021	VP1	Snipe	1	13h03	20-100m	West, over VP	
30.01.2021	VP1	Mute swan	2	13h46	<20m	East	
30.01.2021	VP1	Lapwing	17	14h23	<20m	SSE	Approx. 2km south of VP
30.01.2021	VP2	Curlew	6	09h21	20-100m	SSW	Feeding north of river, lifted and flew west of VP calling
03.02.2021	VP2	Mute swan	4	07h40			Feeding on riverbank at proposed crossing
03.02.2021	VP2	Peregrine	1	07h58	>100m	North	c.250 east of VP
03.02.2021	VP2	Whooper swan	18	08h07	<20m	North	Took off from river c1.3km downstream from VP, flew
03.02.2021	VP2	Whooper swan	29	08h10	<20m	North	

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Date	VP	Species	Flock size	Time first recorded	Height	Direction of flight	Note
03.02.2021	VP2	Whooper swan	5	08h14	<20m	North	downstream before turning north over Newgrange
03.02.2021	VP2	Mute swan	4	08h50			Feeding family moving downstream
03.02.2021	VP2	Mute swan	4	09h05	20-100m	East	Turned back and landed on river c.1km down from VP
03.02.2021	VP2	Mute swan	3	10h37	20-100m	West	Turned between VP and proposed crossing and headed back down river >100m
17.02.2021	VP1	Curlew	9	12h53	<20m	SE	South of VP, flew SE Navan direction
17.02.2021	VP1	Mute swan	1	10h06	<20m	ENE	Over Boyne Bridge
17.02.2021	VP1	Peregrine	1	14h12	20-100m	NNW	Tercel
05.03.2021	VP2	Whooper swan	31	07h19		North	Lifted from river valley c.1km downstream of VP & headed north
05.03.2021	VP2	Mute swan	4	09h42			Feeding in field at proposed crossing (2A/2J)

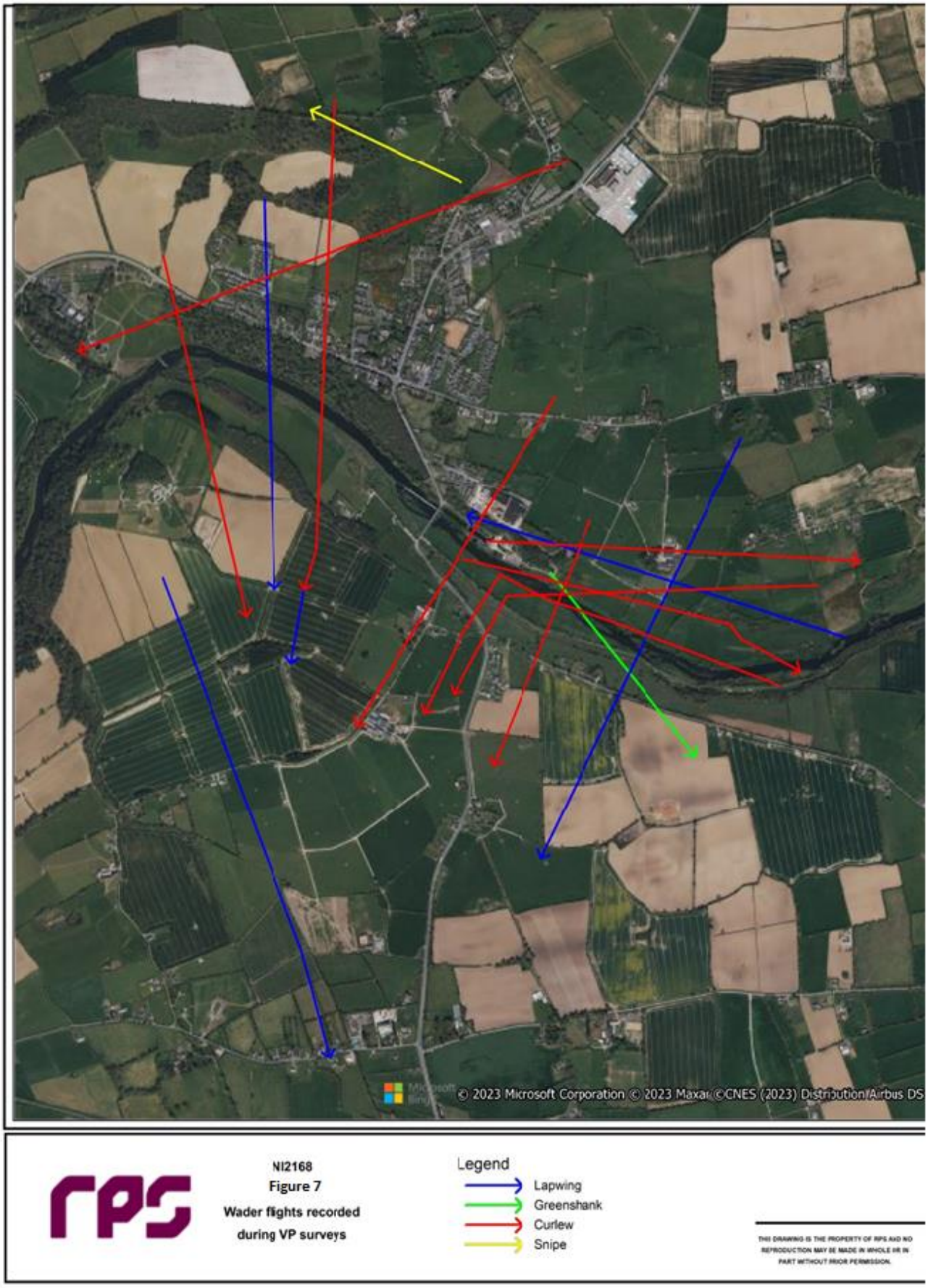

Figure 7: Wader Flights recorded during 2020/2021 VP Surveys

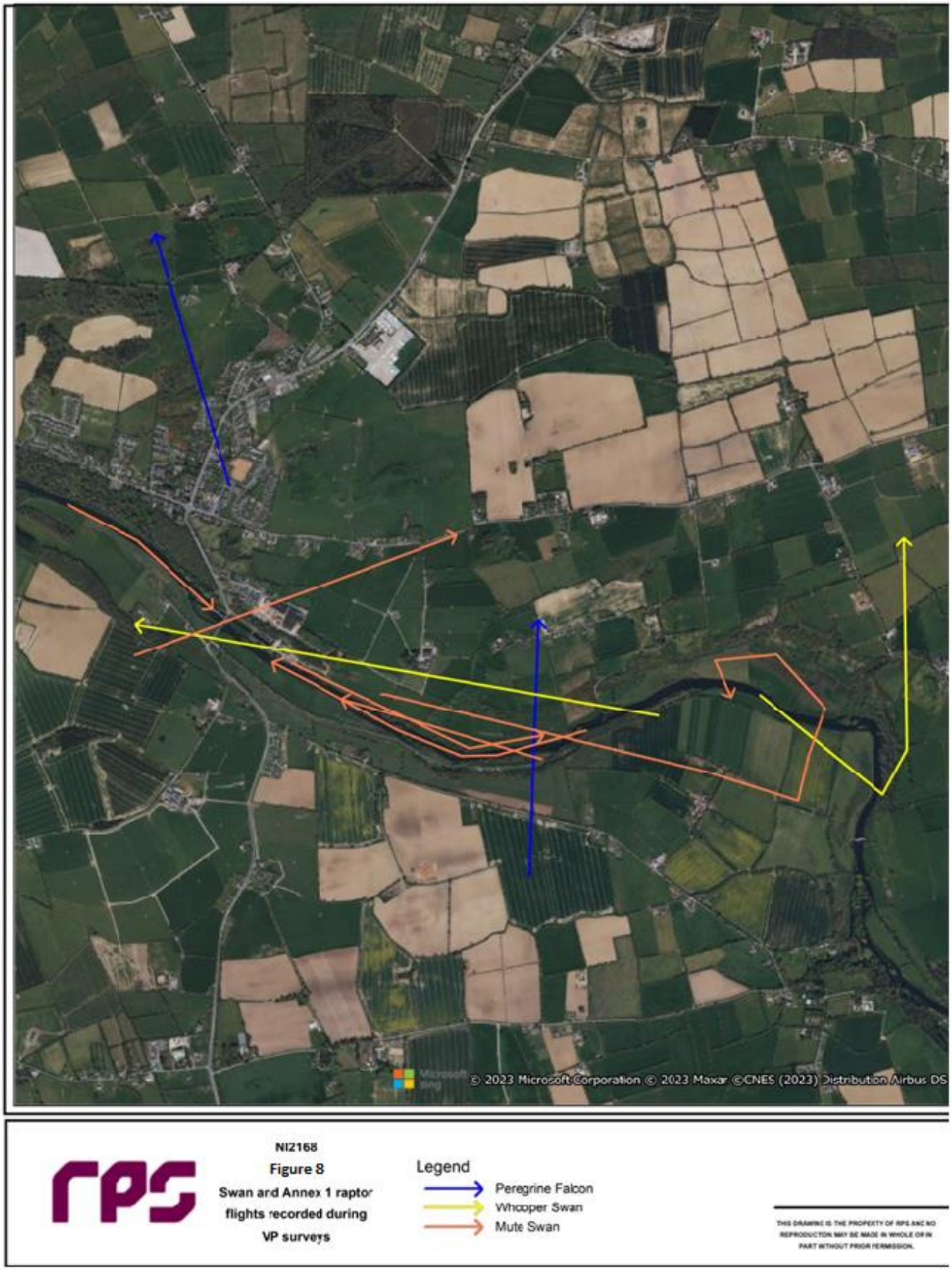

Figure 8: Swan & Annex 1 raptor flights recorded during 2020/2021 VP surveys

Table 19. Target species recorded during Vantage Point Surveys (2021/2022)

Date	VP	Species	Flock size	Time first recorded	Height	Direction of flight	Note
27.12.2021	VP2	Mute swan	2	09h01	<20m	ESE	
27.12.2021	VP1	Mute swan	2	16h03	<20m	West	
10.02.2022	VP2	Mute swan	5	08h55	<20m	Upstream	
25.03.2022	VP2	Mute swan	2	18h15	<20m	Downstream	

Figure 9: Swan Flights recorded during 2021/2022 VP Surveys

A total of 65 flights of seven secondary species were recorded during the 2019/2020 vantage point surveys (see *Table 20*). A total of 103 flights of eight secondary species were recorded during the 2020/2021 vantage point surveys (see *Table 21*). A total of 61 flights of six secondary species were recorded during the 2021/2022 vantage point surveys (see *Table 22*).

Table 20. Secondary species recorded during Vantage Point Surveys (2019/2020)

Secondary species	Number of flights recorded	Number of individuals recorded
Buzzard	16	20
Cormorant	20	30
Grey heron	6	7
Kestrel	6	6
Little egret	10	10
Mallard	6	17
Sparrowhawk	1	1
TOTAL	65	91

Table 21. Secondary species recorded during Vantage Point Surveys (2020/2021)

Secondary species	Number of flights recorded	Number of individuals recorded
Buzzard	23	30
Cormorant	33	35
Grey heron	7	7
Kestrel	5	5
Little egret	11	12
Mallard	14	46
Moorhen	1	1
Sparrowhawk	9	10
TOTAL	103	146

Table 22. Secondary species recorded during Vantage Point Surveys (2021/2022)

Secondary species	Number of flights recorded	Number of individuals recorded
Buzzard	27	31
Cormorant	16	25
Grey heron	3	4
Kestrel	7	7
Mallard	5	13
Sparrowhawk	3	3
TOTAL	61	83

Wintering Farmland Bird Survey Results

Five visits were carried out across the 2019/2020 winter season, four visits across the 2020/2021 winter season, and four visits were carried out across the 2021/2022 winter season for the purposes of surveying wintering farmland birds. Survey dates ranged from early December to mid-March for the 2019/2020 surveys (see *Table 23*), November to February for the 2020/2021 surveys (see *Table 24***)** and December to March for the 2021/2022 surveys (see *Table 25*).

Table 23. Wintering farmland bird survey dates and weather conditions (2019/2020)

Date	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Frost	Temp. (°C)
05.12.2019	08:50	13:25	SE4	Light showers	6	>500m	Good (>2km)	None	7°C
18.12.2019	08:40	13:20	SE4	Light showers	8	>500m	Good (>2km)	None	8°C
07.01.2020	08:50	14:50	SW3	Light showers	7	>500m	Good (>2km)	None	10°C
18.02.2020	07:20	12:50	W3-WSW4	Light showers	8	150m-500m - >500m	Good (>2km)	None	2°C
17.03.2020	06:15	10:40	W2-WSW4	None	3	>500m	Good (>2km)	Ground	0°C - 4°C

Table 24. Wintering farmland bird survey dates and weather conditions (2020/2021)

Date	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Frost	Temp. (°C)
10.11.2020	08h20	13h00	SE2	None	6/8	150-500m	>2km	None	12°C
22.12.2020	08h45	13h10	W2	None	1/8	>500m	>2km	Ground	0°C - 5°C
28.01.2021	09h00	13h10	WSW2	Light showers at end	7/8	150-500m	>2km	None	11°C
18.02.2021	08h10	12h15	E2	None	4/8	150-500m	1-3km - 3-5km	Ground	Fog patches in valley

Table 25. Wintering farmland bird survey dates and weather conditions (2021/2022)

Date	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Frost	Temp. (°C)
22.12.2021	08h20	13h00	E2	Light rain	8/8	unknown	>2km	None	6°C
31.01.2022	08h45	13h10	W2	None	1/8	unknown	>2km	Ground	0°C - 5°C
24.02.2022	09h00	13h10	WSW2	Light showers at end	7/8	unknown	>2km	None	11°C
07.03.2022	07h15	11h00	S4	None	8/8	unknown	>2km	None	

A total of 52, 51 and 39 species were recorded within or in flight over the site during wintering bird surveys across the 2019/2020, 2020/21 and 2021/2022 winter season, respectively (see *Table 26, Table 27* and *Table 28*).

Table 26. Wintering farmland bird survey results (2019/2020)

Species	Visit 1 05-Dec-19	Visit 2 18-Dec-19	Visit 3 07-Dec-20	Visit 4 18-Feb-20	Visit 5 17-Mar-20	Conservation status
Blackbird	19	21	17	18	14	
Blackcap	0	0	1	1	1	
Black-headed gull	0	15	5	14	2	Amber (B)
Blue tit	9	16	12	6	9	

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Species	Visit 1 05-Dec-19	Visit 2 18-Dec-19	Visit 3 07-Dec-20	Visit 4 18-Feb-20	Visit 5 17-Mar-20	Conservation status
Bullfinch	0	2	2	2	2	
Buzzard	2	1	1	2	3	WA
Chaffinch	15	33	27	28	17	
Coal Tit	1	0	0	2	1	
Collared dove	2	6	2	4	4	
Common gull	0	2	0	5	0	Amber (B)
Coot	0	0	0	0	1	Amber (B/W)
Cormorant	1	2	0	2	1	Amber (B/W)
Dunnock	8	8	6	5	7	
Feral pigeon	34	0	0	0	0	
Fieldfare	7	7	0	4	0	
Goldcrest	1	1	0	2	2	Amber (B)
Golden plover	22	0	0	0	0	Red (B/W)
Goldfinch	75	25	4	8	4	
Great tit	6	8	7	8	6	
Greenfinch	0	2	2	4	2	Amber (B)
Grey heron	2	1	1	3	3	
Grey wagtail	0	3	1	0	0	Red (B)
Herring gull	3	0	4	3	0	Amber (B)
Hooded crow	7	7	5	5	1	
House sparrow	10	20	19	11	19	Amber (B)
Jackdaw	153	12	14	24	8	
Kestrel	0	1	0	0	1	WA; Red (B)
Kingfisher	0	0	0	1	1	Amber (B)
Linnet	0	13	11	9	3	Amber (B)
Little egret	1	2	0	0	0	Annex 1
Long-tailed tit	0	6	0	0	0	
Magpie	15	7	4	4	7	
Mallard	4	3	8	4	2	Amber (B/W)
Meadow pipit	0	2	4	3	2	Red (B)
Mistle thrush	1	3	1	2	2	
Moorhen	2	0	2	0	0	
Mute swan	7	2	5	6	6	Amber (B/W)
Pied wagtail	15	14	11	11	7	
Redwing	45	23	14	15	0	
Robin	10	13	10	9	8	Amber (B)
Rook	221	35	17	21	16	
Snipe	6	5	7	5	0	Amber (B/W)
Song thrush	2	5	4	4	2	
Sparrowhawk	1	1	0	0	1	WA
Starling	113	46	71	12	10	Amber (B)
Teal	0	0	2	2	0	Amber (B/W)
Treecreeper	2	1	1	3	1	

Species	Visit 1 05-Dec-19	Visit 2 18-Dec-19	Visit 3 07-Dec-20	Visit 4 18-Feb-20	Visit 5 17-Mar-20	Conservation status
Water rail	1	1	0	0	0	Amber (B)
Woodcock	1	0	0	0	0	Red (B)
Woodpigeon	117	42	29	25	25	
Wren	10	8	9	10	9	
Yellowhammer	0	0	0	1	3	Red (B)

Key to Table 26

Annex 1 – Listed on Annex 1 of the EU Birds Directive

WA – Listed on Part 1 of the Fourth Schedule of the Wildlife Act, 1976

Red – Red listed BoCCI species

Amber – Amber listed BoCCI species

B – BoCCI listed due to breeding population

W – BoCCI listed due to wintering population

Table 27. Wintering farmland bird survey results (2020/2021)

Species	Visit 1 10-Nov-20	Visit 2 22-Dec-20	Visit 3 28-Jan-21	Visit 4 18-Feb-21	Conservation status
Blackbird	19	19	29	18	
Blackcap	1	0	0	0	
Black-headed gull	0	10	0	0	Amber (B)
Blue Tit	12	18	14	13	
Bullfinch	2	2	0	0	
Buzzard	2	0	1	2	WA
Chaffinch	17	40	27	28	
Coal Tit	1	1	2	0	
Collared dove	1	4	0	4	
Common gull	0	0	4	6	Amber (B)
Cormorant	1	1	1	1	Amber (B/W)
Curlew	0	0	2	11	Red (B/W)
Dunnock	5	6	8	5	
Fieldfare	5	3	11	0	
Goldcrest	0	0	0	2	Amber (B)
Goldfinch	15	34	25	24	
Great tit	4	10	8	11	
Greenfinch	2	2	7	3	Amber (B)
Grey heron	1	2	0	1	
Grey wagtail	0	2	0	0	Red (B)
Herring gull	0	0	3	0	Amber (B)
Hooded crow	2	3	10	3	
House sparrow	27	28	17	30	Amber (B)
Jackdaw	2	16	56	8	
Kestrel	0	1	0	0	WA; Red (B)
Kingfisher	0	0	0	1	Amber (B)
Lapwing	9	0	30	4	Red (B/W)
Linnet	14	18	13	16	Amber (B)
Little egret	0	0	0	2	Annex 1
Long-tailed tit	6	11	5	7	
Magpie	3	5	2	2	

Species	Visit 1 10-Nov-20	Visit 2 22-Dec-20	Visit 3 28-Jan-21	Visit 4 18-Feb-21	Conservation status
Mallard	5	0	4	2	Amber (B/W)
Mistle thrush	2	2	7	2	
Moorhen	1	1	1	1	
Mute swan	6	5	6	6	Amber (B/W)
Pied wagtail	8	6	14	5	
Redwing	9	13	14	3	
Reed bunting	2	8	3	0	
Robin	8	14	15	10	Amber (B)
Rook	19	24	42	17	
Siskin	0	0	4	0	
Snipe	0	2	0	2	Amber (B/W)
Song thrush	4	4	6	3	
Sparrowhawk	0	1	0	0	WA
Starling	12	30	61	16	Amber (B)
Teal	0	0	0	2	Amber (B/W)
Treecreeper	1	2	1	4	
Water rail	0	1	1	1	
Woodpigeon	47	24	67	15	
Wren	8	11	8	9	
Yellowhammer	0	4	6	1	Red (B)

Key to Table 27

Annex 1 – Listed on Annex 1 of the EU Birds Directive

WA – Listed on Part 1 of the Fourth Schedule of the Wildlife Act, 1976

Red – Red listed BoCCI species

B – Breeding

W - Wintering

Table 28. Wintering farmland bird survey results (2021/2022)

Species	Visit 1 22-Dec-22	Visit 2 31-Jan-22	Visit 3 24-Feb-22	Visit 4 07-Mar-22	Conservation status
Blackbird	2	22	8	9	
Black-headed gull	0	26	0	0	Amber (B)
Blue tit	0	11	0	5	
Bullfinch	0	4	2	2	
Buzzard	0	3	0	0	WA
Chaffinch	18	5	12	13	
Coal tit	0	1	3	1	
Collared dove	2	0	0	2	
Dunnock	0	3	4	2	
Feral pigeon	0	15	6	4	
Fieldfare	35	138	75	0	
Goldcrest	0	2	2	4	Amber (B)
Goldfinch	0	4	12	18	
Great tit	0	1	0	0	
Greenfinch	0	0	0	1	Amber (B)
Grey heron	1	0	1	1	

Species	Visit 1 22-Dec-22	Visit 2 31-Jan-22	Visit 3 24-Feb-22	Visit 4 07-Mar-22	Conservation status
Hooded crow	2	9	6	0	
House sparrow	8	9	0	18	Amber (B)
Jackdaw	0	179	10	40	
Lesser redpoll	0	0	8	0	
Linnet	0	10	8	10	Amber (B)
Long-tailed tit	0	0	14	0	
Magpie	0	3	4	4	
Mallard	0	7	3	0	Amber [B/W]
Meadow pipit	0	6	4	0	Red (B)
Mistle thrush	2	0	0	2	
Mute swan	0	8	0	0	Amber (B/W)
Pheasant	0	1	0	2	
Pied wagtail	0	1	1	2	
Redwing	22	52	70	0	
Robin	2	21	11	9	Amber (B)
Rook	0	100	40	80	
Skylark	0	19	8	0	Amber (B)
Snipe	0	1	0	0	Amber (B/W)
Song thrush	0	0	0	2	
Starling	30	55	35	36	Amber (B)
Woodpigeon	2	35	20	16	
Wren	5	5	10	12	
Yellowhammer	0	2	6	4	Red (B)

Key to Table 28

Annex 1 – Listed on Annex 1 of the EU Birds Directive
WA – Listed on Part 1 of the Fourth Schedule of the Wildlife Act, 1976
Red – Red listed BoCCI species
B – Breeding
W - Wintering

Overwintering Wildfowl Survey Results

Ten visits were carried out across the 2019/2020 winter season (see *Table 29*), nine visits were carried out across the 2020/2021 winter season (see *Table 30*), and four visits were carried out across the 2021/2022 winter season (see *Table 31*) for the purposes of surveying overwintering wildfowl. Survey dates ranged from November to March.

Table 29. Overwintering wildfowl survey dates and weather conditions (2019/2020)

Date	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Frost	Temp. (°C)
21.11.2019	08:35	14:35	SE2	Light shower first thing	8	>500m	Good (>2km)	None	9°C
28.11.2019	08:15	15:15	NW2	Light showers	7	>500m	Good (>2km)	None	7°C
03.12.2019	08:15	14:15	W1	None	0	>500m	Good (>2km)	Ground	-1°C - 2°C
16.12.2019	09:00	14:45	SW1-SW2	None	1	>500m	Good (>2km)	Ground	1°C - 4°C
09.01.2020	08:50	14:50	NW2	None	5	>500m	Good (>2km)	Ground	0°C - 2°C
29.01.2020	09:15	15:15	SW3	None	1	>500m	Good (>2km)	Ground	2°C

Date	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Frost	Temp. (°C)
06.02.2020	09:30	15:00	0	None	2-5	>500m	Good (>2km)	Ground	-2°C - 3°C
25.02.2020	10:30	16:00	WSW3-W4	Light showers	8	150m-500m	Good (>2km)	Ground	2°C
05.03.2020	09:30	15:30	SW4	None	3-1	>500m	Good (>2km)	None	4°C - 9°C
10.03.2020	13:30	18:00	W4	None	4	>500m	Good (>2km)	None	4°C

Table 30. Overwintering wildfowl survey dates and weather conditions (2020/2021)

Date	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Frost	Temp. (°C)
09.11.2020	07h45	12h45	SE3	Drizzle for 10 mins	6/8	150-500m	>5km	None	12°C
27.11.2020	08h05	13h00	NW1	None	1/8	>500m	>5km	Ground	-1°C - 4°C
03.12.2020	08h20	13h45	SW2-NW3	None	7/8	150-500m	>5km	None	
09.12.2020	10h00	15h00	SW2	Light shower at end	7/8	150-500m	>5km	None	4°C - 0°C
04.01.2021	08h45	13h45	SW2	Light drizzle	8/8	150-500m	>5km	None	7°C
11.01.2021	09h15	15h00	SW3	Light shower at end	8/8	150-500m	>5km	None	4°C - 8°C
04.02.2021	07h35	12h35	SW3	Light showers	8/8	150-500m	>2km	None	8°C
19.02.2021	08h05	13h25	SW3	None	2/8	>500m	>2km	None	8°C
18.03.2021	07h05	12h40	NW3	None	6/8	150-500m	>2km	None	9°C

Table 31. Overwintering wildfowl survey dates and weather conditions (2021/2022)

Date	Start	End	Wind (Beaufort)	Precipitation	Cloud (Oktas)	Cloud height	Visibility	Frost	Temp. (°C)
28.12.2021	13h50	16h40	S1	Light showers	8	unknown	>2km	None	7°C
06.01.2022	08:30	11:45	SSE4		8	Unknown	>2km	None	5°C
09.02.2022	08:00	11:30	W4	Light rain showers	8	Unknown	>2km	None	7°C
08.03.2022	14:00	17:45	SE4	Showers	8	unknown	>2km	None	8°C

A total of 14 species were recorded within the survey area during overwintering wildfowl surveys across the 2020/2021 winter season (see *Table 33*), compared to 10 species in the 2019/2020 season (see *Table 32*). There were no target species recorded within the survey area during the overwintering wildfowl surveys across the 2021/2022 winter season.

Table 32. Overwintering wildfowl survey results (2019/2020)

Date	Species	Number present	Location
21.11.2019	Mute Swan	8	Boyne
21.11.2019	Lapwing	29	McGruder's Cross
21.11.2019	Snipe	2	McGruder's Cross
28.11.2019	Curlew	2	McGruder's Cross

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Date	Species	Number present	Location
28.11.2019	Snipe	3	McGruder's Cross
28.11.2019	Mute Swan	7	Boyne
03.12.2019	Curlew	5	McGruder's Cross
03.12.2019	Snipe	6	McGruder's Cross
03.12.2019	Mute Swan	6	Boyne
03.12.2019	Little Egret	1	Boyne
16.12.2019	Golden Plover	6	McGruder's Cross
16.12.2019	Lapwing	19	McGruder's Cross
16.12.2019	Curlew	2	McGruder's Cross
16.12.2019	Snipe	6	McGruder's Cross
16.12.2019	Mute Swan	6	Boyne
09.01.2020	Mute Swan	9	Boyne
09.01.2020	Lapwing	38	McGruder's Cross
29.01.2020	Grey Heron	2	McGruder's Cross
29.01.2020	Golden Plover	19	McGruder's Cross
29.01.2020	Curlew	5	McGruder's Cross
29.01.2020	Snipe	2	McGruder's Cross
06.02.2020	Grey Heron	3	Boyne
06.02.2020	Mute Swan	7	Boyne
06.02.2020	Grey Heron	2	McGruder's Cross
25.02.2020	Grey Heron	1	McGruder's Cross
25.02.2020	Little Egret	2	McGruder's Cross
25.02.2020	Curlew	2	McGruder's Cross
25.02.2020	Snipe	2	McGruder's Cross
25.02.2020	Mute Swan	8	Boyne
25.02.2020	Grey Heron	2	Boyne
05.03.2020	Grey Heron	1	McGruder's Cross
05.03.2020	Grey Heron	3	Boyne
05.03.2020	Little Egret	1	Boyne
05.03.2020	Mallard	4	Boyne
05.03.2020	Mute Swan	5	Boyne
05.03.2020	Mute Swan	2	Taylor's Lane
10.03.2020	Grey Heron	1	McGruder's Cross
10.03.2020	Grey Heron	4	Boyne
10.03.2020	Mute Swan	5	Boyne
10.03.2020	Mallard	4	Boyne
10.03.2020	Little Grebe	2	Boyne
10.03.2020	Mute Swan	2	Taylor's Lane
10.03.2020	Whooper Swan	19	Taylor's Lane
21.11.2019	Mute Swan	8	Boyne

Figure 10: Swan records from 2019/2020 wildfowl surveys

Figure 11: Heron Records from 2019/2020 Wildfowl Surveys

Figure 12: 2019/2020 Wildfowl Survey Records of Waders, Duck & Grebe

Table 33. Overwintering wildfowl survey results (2020/2021)

Date	Species	Number present	Location
09.11.2020	Grey heron	3	Boyne
09.11.2020	Little egret	1	Boyne
09.11.2020	Mute swan	6	Boyne
09.11.2020	Cormorant	2	Boyne
09.11.2020	Grey heron	1	McGruder's Cross
09.11.2020	Curlew	3	McGruder's Cross
27.11.2020	Snipe	2	Mooretown
27.11.2020	Kingfisher	1	Boyne
27.11.2020	Mute swan	6	Boyne
27.11.2020	Water rail	1	Boyne
27.11.2020	Grey heron	1	Boyne
27.11.2020	Cormorant	3	Boyne
27.11.2020	Lapwing	18	Rossnaree
27.11.2020	Grey heron	1	McGruder's Cross
09.12.2020	Golden plover	12	Crewbane
09.12.2020	Lapwing	32	Crewbane
09.12.2020	Mute swan	6	Boyne
09.12.2020	Lapwing	11	McGruder's Cross
09.12.2020	Grey heron	1	McGruder's Cross
09.12.2020	Curlew	8	McGruder's Cross
03.12.2020	Whooper swan	16	East of Taylor's Lane
03.12.2020	Lapwing	23	McGruder's Cross
03.12.2020	Curlew	16	McGruder's Cross
03.12.2020	Snipe	2	McGruder's Cross
03.12.2020	Grey heron	2	McGruder's Cross
03.12.2020	Little egret	2	McGruder's Cross
03.12.2020	Cormorant	2	Boyne
03.12.2020	Grey heron	1	Boyne
03.12.2020	Little egret	1	Boyne
03.12.2020	Mute swan	6	Boyne
03.12.2020	Moorhen	1	Boyne
03.12.2020	Water rail	1	Boyne
03.12.2020	Curlew	8	Field north of Boyne at crossing
04.01.2021	Grey heron	3	McGruder's Cross
04.01.2021	Little egret	2	McGruder's Cross
04.01.2021	Curlew	31	McGruder's Cross
04.01.2021	Lapwing	27	McGruder's Cross
04.01.2021	Snipe	4	McGruder's Cross
04.01.2021	Teal	2	Boyne
04.01.2021	Mallard	10	Boyne
04.01.2021	Moorhen	3	Boyne
04.01.2021	Grey heron	4	Boyne
04.01.2021	Mute swan	6	Boyne
04.01.2021	Snipe	2	Boyne

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Date	Species	Number present	Location
04.01.2021	Little egret	1	Boyne
04.01.2021	Cormorant	2	Boyne
04.01.2021	Kingfisher	1	Boyne
04.01.2021	Lapwing	40	Higginstown
04.01.2021	Lapwing	26	Taylor's Lane
04.01.2021	Whooper swan	6	Taylor's Lane
11.01.2021	Little egret	3	McGruder’s Cross
11.01.2021	Lapwing	26	Thurstianstown
11.01.2021	Grey heron	3	Boyne
11.01.2021	Little egret	2	Boyne
11.01.2021	Mute swan	6	Boyne
11.01.2021	Curlew	2	Boyne
11.01.2021	Cormorant	2	Boyne
11.01.2021	Lapwing	25	Taylor's Lane
04.02.2021	Whooper swan	19	East of Taylor's Lane
04.02.2021	Curlew	12	McGruder’s Cross
04.02.2021	Lapwing	7	McGruder’s Cross
04.02.2021	Little egret	2	McGruder’s Cross
04.02.2021	Grey heron	3	Boyne
04.02.2021	Cormorant	3	Boyne
04.02.2021	Little egret	2	Boyne
04.02.2021	Mute swan	5	Boyne
19.02.2021	Whooper swan	27	West of Taylor's Lane
19.02.2021	Whooper swan	22	East of Taylor's Lane
19.02.2021	Curlew	2	Thurstianstown
19.02.2021	Grey heron	1	Cullen
19.02.2021	Lapwing	8	Mooretown
19.02.2021	Kingfisher	1	Boyne
19.02.2021	Mute swan	5	Boyne
19.02.2021	Cormorant	1	Boyne
19.02.2021	Mallard	6	Boyne
19.02.2021	Grey heron	1	Boyne
19.02.2021	Mallard	4	Boyne
18.03.2021	Mallard	6	Boyne
18.03.2021	Kingfisher	2	Boyne
18.03.2021	Grey heron	2	Boyne
18.03.2021	Little egret	1	Boyne
18.03.2021	Cormorant	1	Boyne
18.03.2021	Snipe	2	Boyne
18.03.2021	Moorhen	1	Boyne
18.03.2021	Water rail	1	Boyne

Figure 13: Swan Records from 2020/2021 wildfowl surveys

Figure 14: Heron Records from 2020/2021 wildfowl surveys

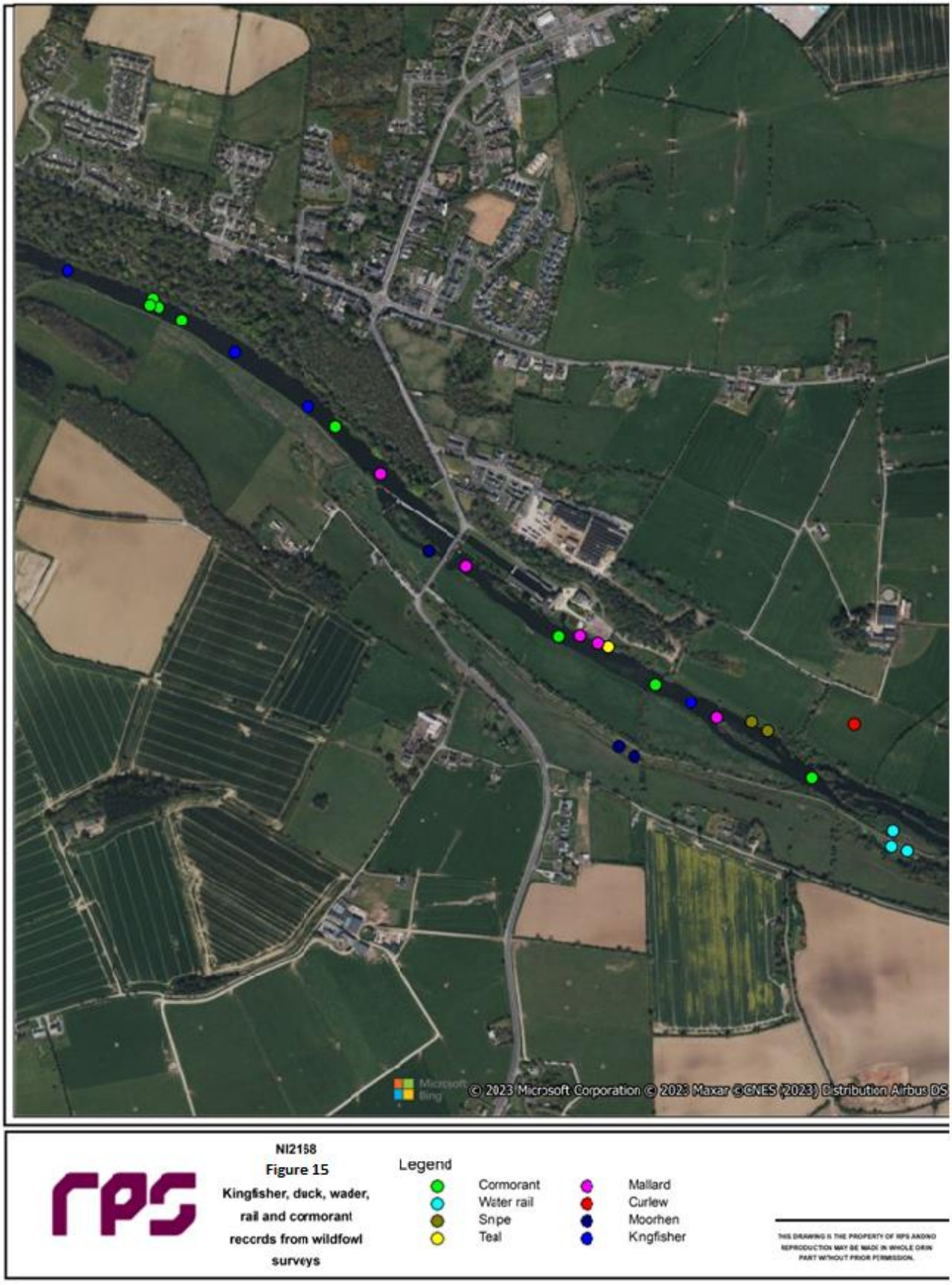

Figure 15: 2020/2021 Wildfowl Survey Records of Waders, Duck & Grebe

Appendix 1.3

Surface Water Quality Standards (relevant legislation)

Table 34. Surface Water Quality Standards

Parameter	Units	Salmonid Water Regulations 1988 (Mandatory Levels)	European Communities Environmental Objectives (Surface Water) Regulations 2009
BOD	mg/l	≤ 5	River Water body High Status ≤ 1.3 (mean) or ≤ 2.2 (95%ile) Good Status ≤ 1.5 (mean) or ≤ 2.6 (95%ile) Transitional Water body ≤ 4 (95%ile)
Suspended solids	mg/l	≤ 25	N/A
pH	-	≤ 6.5 & ≤ 9.5	River Water body 4.5-9.0 (Soft Water) 6.0-9.0 (Hard Water) Transitional Water body N/A
Conductivity	µg/cm	N/A	N/A
Phosphates	mg/l P_2O_5	N/A	N/A
Molybdate Reactive Phosphorus (MRP)	mg/l P	N/A	River Water body High Status≤ 0.025 (mean) or ≤ 0.045 (95%ile) Good Status≤ 0.035 (mean) or ≤ 0.075 (95%ile) Transitional Water body (0-17 psu) ≤ 0.060 (median) (35 psu) ≤ 0.040 (median)
Chloride	mg/l Cl	N/A	N/A
Ammonium	mg/l NH_4	≤ 1.0	N/A
Total Ammonia	mg/l	N/A	River Water body High status ≤ 0.04 (mean) or ≤ 0.09 (95%ile) Good Status ≤ 0.14 (mean) or ≤ 0.065 (95%ile) Transitional Water body N/A
Nitrate	mg/l NO_3	N/A	N/A
Nitrite	mg/l NO_2	≤ 0.05	N/A
Dissolved Oxygen	-	50% ≥ 9 mg/l	River Water body Lower limit: 95%ile>80% saturation Upper Limit: 95%ile<120 %saturation Transitional Water body (Summer) (35 psu) Lower limit: 95%ile>80% saturation Upper Limit: 95%ile<120 %saturation (0 psu) Lower limit: 95%ile>70% saturation Upper Limit: 95%ile<130 %saturation
Total Hardness	mg/l $CaCO_3$	N/A	N/A
Copper	mg/l Cu	≤ 0.005 ≤ 0.022 ≤ 0.04 ≤ 0.112	Inland Surface Waters 5 – water hardness ≤100mg/l $CaCO_3$ 30 – water hardness >100mg/l $CaCO_3$ Other Surface Waters 5 – water
Zinc	mg/l Zn	≤ 0.03 ≤ 0.2	Inland Surface Waters 0.008 – water hardness ≤100mg/l $CaCO_3$

Parameter	Units	Salmonid Water Regulations 1988 (Mandatory Levels)	European Communities Environmental Objectives (Surface Water) Regulations 2009
		≤ 0.3 ≤ 0.5	0.05 – water hardness >10 ≤100mg/l CaCO3 0.1 – water hardness >100mg/l CaCO3 Other Surface Waters 0.04 – water hardness
Total coliforms	No/100ml	N/A	N/A
Faecal coliforms	No/100ml	N/A	N/A

Appendix 1.4

Baseline Data

Biological and Physicochemical Water Quality

Relevant Legislation and Quality Standards

The Proposed Scheme will span the River Boyne and intersect the Mattock (Mooretown) Stream; a tributary of the Mattock River, itself a tributary of the River Boyne. The River Boyne is a designated SAC and the main channel is also a designated salmonid river. Potential for sedimentation and pollution could be detrimental to the integrity of this European site. Two statutory instruments are of relevance to this assessment owing to the presence of QI salmon and river lamprey within the River Boyne and River Blackwater SAC, these include:

- S.I. No. 293/1988 - European Communities (Quality of Salmonid Waters) Regulations, 1988: S.I. No. 293/1988 gives effect to Council Directive No. 78/659 on the quality of fresh waters needing protection or improvement in order to support fish life by prescribing quality standards. These Regulations prescribe quality standards for salmonid waters and designate the waters to which they apply; and
- S.I. No. 272/2009 - European Communities Environmental Objectives (Surface Waters) Regulations 2009: These Regulations establish legally binding quality objectives for all surface waters and environmental quality standards for pollutants for purposes of implementing provisions of Community legislation on protection of surface waters.

A summary of the salmonid water quality standards (S.I. No. 293/1988) along with surface water standards (S.I. No. 272/2009) are provided in **Appendix 1.3 – Surface Water Quality Standards Relevant Legislation)**. For this assessment, particular cognisance is made to the quality standard detailed for suspended solids (≤ 25 mg/l) owing to the nature of the works and the location of the proposed bridge within the floodplain of the River Boyne and River Blackwater SAC.

EPA Biological River Monitoring Data

The WFD is enforced in Ireland under the European Union Environmental Objectives (Surface Waters) Regulations S.I. No. 272/2009, as amended. A target for Q4 and above is required for rivers sites to comply with good (Q4) or better (Q5) status required under the directive.

Table 35 shows most recent (2020) river monitoring results from relevant EPA river stations (RS) on the River Boyne and its Mattock tributary. Q-value status, as reported by the EPA, is determined by the biological quality element: macroinvertebrate fauna. The data shows impaired water quality in the vicinity of Navan, with a gradual improvement occurring over distance downstream.

The River Boyne is currently reported at 'moderate' status (Q3-4) just upstream of Slane Bridge, but 'good' status (Q4) from Slane Bridge downstream to the estuary. The Mattock is also at 'good' status (Q4) just upstream of its confluence with the Boyne. The Mattock (Mooretown) stream is not monitored as part of the EPA river monitoring programme.

Table 35: EPA Biological River Monitoring Data: Boyne Sub-catchment (2020)

EPA River Station Code	EPA River Water Body Name	Station Name	Location in relation to Proposed Scheme	2020	Q-value Status
RS07M010300	Mattock_030	New Br u/s Boyne R confluence	approx. 4.5 km d/s of the proposed Mattock crossing	Q4	Good
RS07B042200	Boyne_180	Oldbridge (Obelisk Br)	approx. 12.8 km d/s of the proposed Boyne crossing	Q4	Good
RS07B042100	Boyne_160	Slane Br.	approx. 0.6 km u/s of the proposed Boyne crossing	Q4	Good
RS07B042010	Boyne_150	d/s Broadboyne Br (RHS)	approx. 6.3 km u/s of the proposed Boyne crossing	Q3-4	Moderate
RS07B011800	Blackwater (Kells)_120	Slane Rd Br Navan	approx. 13.6 km u/s of the proposed Boyne crossing	Q3	Poor
RS07B041700	Boyne_120	Kilcarn Old Bridge	approx. 14 km u/s of the proposed Boyne crossing	Q3-4	Moderate

Physicochemical Data

Sampling Locations

As part of the baseline study, water sampling was carried out at eight locations across the area of the Proposed Scheme. Samples were collected twice monthly for 12 consecutive months from August 2021 to August 2022 in order to characterise the existing water quality. The eight locations (see *Figure 16*), five of which were located within the River Boyne (Sites A, B, E1, E4, E5), one of which was located within the Slane canal (Site E2), and two of which were located within the River Mattock (Site C and D) are listed in *Table 36* below. Turbidity levels were also continuously monitored at the existing bridge crossing.

Table 36: Water quality sampling locations and distance from the Proposed Scheme

Location (ITM)	Sample Location ID	EPA River Water Body Name	Location in relation to Proposed Scheme
696617, 773470	A	Boyne_170	approx. 0.27 km u/s
698716, 773417	B	Boyne_170	approx. 1.96 km d/s
697120, 775394	C	Mattock_030	approx. 0.11 km u/s
697341, 775272	D	Mattock_030	approx. 0.03 km d/s
696094, 773909	E1	Boyne_160	approx. 0.95 km u/s
696596, 773330	E2	n/a (Slane Canal)	approx. 0.13 km d/s
703835, 775522	E4	Boyne_180	approx. 11.23 km d/s
703756, 775914	E5	Boyne_180	approx. 11.62 km d/s

Baseline Results

The results of water quality sampling at the above locations are provided in detail in **EIAR Volume 4**, **Appendix 17.1**. The following summarises the findings of these baseline surveys and indicates aquatic habitat suitability.

River Boyne

Results show the Boyne to be moderately nutrient enriched, with notably elevated mean and 95 percentile values for orthophosphate and ammonia, and slightly elevated total organic nitrogen (TON). The data confirms there are upstream sources of nutrient enrichment in the catchment, likely of agricultural and/or waste water discharge origin.

Occasional spikes in total suspended solids (TSS) were recorded in discrete grab samples. Maximum TSS concentration during the sampling period was 72 mg/l recorded on 13 December 2021, at Site B (just downstream of Slane). TSS values on that day were 56 mg/l and 40 mg/l at E1 and A, respectively. TSS means for the Boyne main channel sites near Slane over the overall sampling period (n=16 samples) were 17 mg/l at sites A and B, and 12 mg/l at E1. Mean TSS does not exceed the 25 mg/l (mean annual) criteria for this designated salmonid river.

The values are on the high side of ideal for a salmonid river, but the sampling period did cover the winter months when spates and hence sediment transport may be more common. Continuous turbidity data was recorded over this same monitoring period, but the data was unreliable. Results appeared confounded by, for example, turbulence and/or bio-fouling of sondes. The value of the turbidity data is to show that there are major problems with continuous turbidity measurement on such a large, swift river, likely related to the difficulty of anchoring and maintaining the sonde.

A biological oxygen demand (BOD) spike was recorded at Site B September to October 2021, but BOD was otherwise within criteria for ‘good’ status at all sites. Elevated BOD issue at Site B is likely to have been associated with die-back, degradation and wash-out (in the autumn months) of instream vegetation from the upstream, adjoining navigation canal. Excessive macroalgal growth was recorded at times on the Boyne main channel during summer baseline surveys, mainly *Cladophora* spp., a species that indicates enriched nutrient conditions.

Overall, the water sampling results tend to not support the classification of 'good' status on the Boyne. Macroinvertebrate sampling in 2020 and 2021 indicated 'good' status (Q4), aligning with EPA assigned status. The instream conditions are considered, overall, to be borderline for salmon parr nursery (more impaired than ideal).

Mattock (Mooretown) Stream

This stream is highly nutrient enriched, with elevated mean and 95 percentile values for orthophosphate, ammonia and suspended solids, and high BOD on occasion. TON is not considered high for an eastern agricultural stream, suggesting that high levels of ammonia present are prevented from oxidization, possibly linked with excessive algal growth and consequent oxygen fluctuations. Nutrient concentrations at both sites are well in excess of those required to meet 'good' ecological status under surface water regulations. This aligns with macroinvertebrate sampling that indicates biological water quality is 'poor' status.

Suspended solids (TSS) concentrations were often excessive at both site C and D. Maximum values were 457 mg/l (site C) and 791 mg/l (site D), with means (n=16 samples) of 88 mg/l and 100 mg/l, respectively. The results are likely linked to tillage related run-off.

In addition, site C (upstream) had consistently elevated concentrations of trace heavy metals, with mean values indicating exceedance of surface water standards (EQS). The chemical signature at site C suggests inorganic fertilizer application is the likely source of elevated metal concentrations. Presence of heavy metals in inorganic fertilizers, or as separate micronutrient applications, is well established in agricultural practice, with trace heavy metals commonly applied (as micronutrients) to Irish soils, including zinc, copper, cadmium (Teagasc, 2020) which are regularly elevated at site C. The relatively low levels of these trace metals at Site D, just 200 m downstream suggests some form of removal within the stream, which could be the result of uptake by plants, i.e. known uptake of zinc by *Heliosciadium nodiflorum* (Bruen et al., 2006), or adsorption onto sediment and substrates.

Overall, the water chemistry indicates a strong agricultural influence, with current drainage from the existing N2 not considered a significant source of additional nutrient and trace metals to the stream. The stream would not be expected to support salmon owing to its small size and impaired water quality.

Macroinvertebrate Fauna and Q-Value Analysis

Macroinvertebrate sampling results and consequent Q-value ratings are listed in **Appendix 1.5**. The following summarises the findings of baseline surveys and assigns an ecological quality category to each watercourse.

River Boyne

The study reach covered approx. 1,300 m downstream of Slane Bridge. The focus was on the proposed bypass crossing point on the Boyne, and habitats / aquatic receptors of the 500 m reach downstream of that point. In the vicinity of the crossing point the river is wide (approx. 40 m; depth not visible) forming a swift glide with standing waves in the mid-channel.

The right hand side (RHS) river margin has a sandy berm (3-4 m wide) supporting various emergent macrophytes including reed sweet-grass (*Glyceria maxima*), reed canary grass (*Phalaris arundinacea*), brooklime (*Veronica beccabunga*), and Yellow iris (*Iris psuedocorus*). Occasional stands of common club-rush (*Schoenoplectus australis*) were recorded and branched burr-reed (*Sparganium erectum*) occurs in the summer. The RHS floodplain is low-lying and of low gradient, forming a wet-to-damp meadow with occasional waterlogged drainage runnels.

The left hand side (LHS) river margin is similar but with a steeper rise beyond the river bank onto improved grassland. Downstream of the proposed crossing point a mid-channel island splits the channel, then merges through gaps in an old, dilapidated and diagonally orientated fish weir. These morphological features create nice flow diversity for salmon including channels of fast water (nursery and foraging habitat) and slack pools, glides and backwaters (holding and resting habitat).

Sandy sediment deposits at margins and in backwaters would support juvenile river lamprey. The channel is the migration route for salmon river lamprey. The Slane area is a very important recreational salmon fishery, leased out to Slane Bridge Anglers and Rossin and Slane Angling Clubs. IFI estimate approx. 300 salmon are caught and released downstream of Slane each year, many of them close to the proposed crossing reach.

Q-value data (**Appendix 1.5**) rates the reach at Q4, ‘good’ status, though likely close to the Q3-4 ‘moderate’ boundary judging by water chemistry data.

Mattock (Mooretown) Stream

The study area covered a 250 m reach of the stream encompassing the existing N2 culvert, and the downstream reach, including adjoining drains. This is a small stream in the upper headwaters of the Mattock River which has been heavily drained for agricultural purposes. The stream is bound by hedgerow with tillage land beyond. Though subject to occasional dredging, it appears to recover cobble / gravel substrates in reaches of faster riffle/run type flows. The stream in the proposed crossing reach is unsuitable for salmon or river lamprey, owing to its small size, drainage and impaired water quality.

Q-value data (**Appendix 1.5**) rates the stream at Q3, ‘poor’ status.

N

Location C
Location D
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and

Location E5
RS07M010300
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and

Location C
Location D

Location E5
RS07M010300
Location E4

Location E1
RS07B042100
Location A
Location E2

Location B

Location E1
RS07B042100
Location A
Location E2
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Location B
Source: Esri, Maxar, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AeroGRID, IGN, and the GIS User Community

Legend

- Proposed Scheme Alignment
- Lands Made Available
- 500 m ZoI
- EIAR Sampling Points
- EPA sampling points

Data Source: Environmental Protection Agency (EPA)
Biological Quality Stations 2021

0 0.375 0.75 1.5
Kilometres

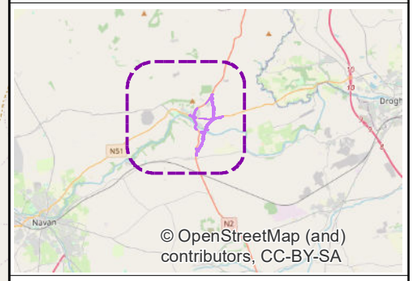

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Figure 16

Water Quality Sampling Locations

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Otter Survey Results

Table 37: Otter Survey Records

Survey Type	Survey Date	Comment	Approx. Distance from Redline Boundary
Bankside Assessment	20/06/2018	Spraints (x7) along and under 1st arch of southern side of existing N2 bridge	0.0043 km northwest
Bankside Assessment	20/06/2018	Possible couche and slide into deeper water	0.068 km southeast
Bankside Assessment	20/06/2018	1 print in sandy river access. Slide from bank into deep water	0.1525 km northeast
Bankside Assessment	20/06/2018	Multiple spraints along trail fronting Mill House fence. Land has been sprayed	0.2064 km north
Bankside Assessment	20/06/2018	Plentiful sprainting with fish scales at boulder fronting CoCo WWTP outfall	0.0554 km west
Bankside Assessment	20/06/2018	Trail on island heading from North to Southeast. Viewed by binoculars only.	0.1554 km southeast
Bankside Assessment	20/06/2018	Plentiful sprainting on rocks around islands	0.2891 km southeast
Bankside Assessment	20/06/2018	Sprainting and slides	0.2914 km southeast
Bankside Assessment	03/09/2018	x2 old otter spraint.	0.299 km southeast
Bankside Assessment	03/09/2018	Spraint (x1)	0.3231 km west
Bankside Assessment	04/09/2018	Otter slide into overgrown canal	0.3364 km southeast
Boat Survey	11/11/2018	Otter spraint on rock (x1)	0.0674 km southwest
Boat Survey	11/11/2018	Otter or mink spraint- very old, fish scales but no fur present. (x1)	0.3926 km west
Boat Survey	11/11/2018	Old mink spraint (fish scales and hair in spraint), on riverbank/stone by the water's edge	0.4275 km west
Bankside Assessment	22/01/2020	Spraint on instream boulder	Within redline boundary
Bankside Assessment	22/01/2020	Spraint	0.0566 km east
Bankside Assessment	22/01/2020	Slide	0.0901 km southeast
Bankside Assessment	22/01/2020	Spraint	0.0539 km west
Bankside Assessment	22/01/2020	Spraint	0.0482 km southeast
Bankside Assessment	22/01/2020	Spraint evidence (non-fishy)	0.121 km south
Bankside Assessment	22/01/2020	Otter slide	0.2441 km southeast
Bankside Assessment	22/01/2020	Spraint and Couche	0.4411 km southeast
Bankside Assessment	22/01/2020	Spraint	0.4362 km southeast
Bankside Assessment	16/09/2021	old- repeated jelly deposits x 3. Time between deposits	0.006 km northwest
Bankside Assessment	16/09/2021	Older spraints, varying ages. One jelly deposit adjacent. Hairs and large fish scale within (10-12 mm)	Within redline boundary
Bankside Assessment	16/09/2021	Contains fish bones, teeth, eggs and scales.	Within redline boundary
Bankside Assessment	16/09/2021	Large mound of spraint toward eastern end of bridge	Within redline boundary
Bankside Assessment	16/09/2021	upper side- multiple droppings, smaller (voles)	0.0198 km southeast
Bankside Assessment	16/09/2021	1 very fresh spraint under reservoir wall - strong odour. Small. 12 more small droppings the same.	0.0338 km southeast
Bankside Assessment	16/09/2021	1 older spraint under reservoir wall	0.0342 km southeast
Bankside Assessment	16/09/2021	Multiple spraints	0.0424 km southeast
Bankside Assessment	16/09/2021	Trail	0.0435 km southeast

Survey Type	Survey Date	Comment	Approx. Distance from Redline Boundary
Bankside Assessment	16/09/2021	Spraints/Rest location- not quite a couche (smoothed off rock. Maybe feeding location, well-worn surface)	0.0443 km southeast of redline boundary
Bankside Assessment	16/09/2021	Couche And Spraints (x2)	0.0465 km southeast of redline boundary
Bankside Assessment	16/09/2021	Spraints	0.0473 km southeast of redline boundary
Bankside Assessment	16/09/2021	trail down to water, no slide obvious. Rat prints in mud	0.0585 km southeast of redline boundary
Bankside Assessment	16/09/2021	Traps - baited with sardine, not occupied or set off	0.1482 km northeast of redline boundary
Bankside Assessment	16/09/2021	Trail To Water. No discernible prints	0.1556 km northeast of redline boundary
Bankside Assessment	16/09/2021	Trail To Water. No discernible prints	0.1581 km northeast of redline boundary
Bankside Assessment	16/09/2021	2 trails across to canal - pond / wet patch in field on river side. Likely use	Within redline boundary
Bankside Assessment	16/09/2021	Spraints (x2), placed on tuffet of grass.	0.0096 km east of redline boundary
Bankside Assessment	16/09/2021	Trail	0.1201 km west of redline boundary
Bankside Assessment	16/09/2021	Trail	0.0857 km east of redline boundary
Bankside Assessment	16/09/2021	Trail	0.1129 km east of redline boundary
Bankside Assessment	16/09/2021	Trail	0.1379 km east of redline boundary
Bankside Assessment	16/09/2021	Spraints - fish scales, bones within. Not fresh (1wk?)	0.1656 km southeast of redline boundary
Bankside Assessment	16/09/2021	Trail. Connectivity- River to canal	0.1946 km south of redline boundary
Bankside Assessment	16/09/2021	Trail. Trail off Towpath, through fence	0.1988 km southeast of redline boundary
Bankside Assessment	16/09/2021	Trail. Connection to preceding trail across towpath	0.2595 km southeast of redline boundary
Bankside Assessment	16/09/2021	sprainting rock on island	0.2495 km southeast of redline boundary
Bankside Assessment	16/09/2021	Trail. Connection to preceding trail across towpath	0.2925 km southeast of redline boundary
Bankside Assessment	16/09/2021	Trail	0.6242 km southeast of redline boundary
Bankside Assessment	16/09/2021	Spraints	Within redline boundary
Bankside Assessment	16/09/2021	Spraints on rock	Within redline boundary
Bankside Assessment	16/09/2021	Spraints	Within redline boundary
Bankside Assessment	16/09/2021	Spraints (x2) on stick/branch	Within redline boundary
Bankside Assessment	16/09/2021	Spraints (x3) on old rock	Within redline boundary
Boat Survey	03/11/2021	Spraint (x1) on island downstream of proposed bridge crossing.	0.115 km southeast

Survey Type	Survey Date	Comment	Approx. Distance from Redline Boundary
Walkover survey	09/03/2022	Spraint (x1) on southern bank of Boyne, eastern side of existing N2 Slane Bridge.	0.009 km from redline boundary (Public Realm proposals)
Atkins otter survey	May & June 2023	Holt - large, excavated holt on north side of river island (d/s of weir). Holt 1m above base flow with 0.5m by 0.4m entrance with narrower tunnel under crack willow. Well-worn entrance and likely active. (south bank).	1.3 km upstream from redline boundary (Public Realm proposals)
Atkins otter survey	May & June 2023	Spraint - on sycamore roots on river island (south bank)	1.3 km upstream from redline boundary (Public Realm proposals)
Atkins otter survey	May & June 2023	Spraint and slide - regular spraint site in side channel on deadwood, with adjacent slide to river (south bank)	1.3 km upstream from redline boundary (Public Realm proposals)
Atkins otter survey	May & June 2023	Spraint - on tree limb on north bank adjoining woodland	0.86 km upstream from redline boundary (Public Realm proposals)
Atkins otter survey	May & June 2023	Spraint - old spraint on boulder at north side of small island upstream of Slane Bridge (south bank)	0.055 km upstream from redline boundary (Public Realm proposals)
Atkins otter survey	May & June 2023	Spraint - site under 1st wet arch southern bank	Within the redline boundary
Atkins otter survey	May & June 2023	Spraint - very regular spraint site under northern arch adjoining weir spillover	Within the redline boundary
Atkins otter survey	May & June 2023	Spraint - site under northernmost arch	Within the redline boundary
Atkins otter survey	May & June 2023	Spraint - site on crack willow root system adjoining millrace channel (north bank)	0.072 km downstream of the redline boundary (Public Realm proposals)
Atkins otter survey	May & June 2023	Couch - regularly used couch site with latrines and spraint on sand and mud bank in masonry arch culvert spillover channel from canal millrace (north bank)	0.12 km downstream of the redline boundary (Public Realm proposals)
Atkins otter survey	May & June 2023	Couch - with regular spraint site under old plastic barrel and crack willow (north bank)	0.207 km downstream of the redline boundary (proposed bridge crossing)

Legend

- Proposed Scheme
- Proposed Scheme Boundary

Atkins Otter Evidence (2023)

- Couch & spraint
- Holt
- Spraint
- Spraint & slide

RPS Otter Evidence

- Couche
- Fish scales
- Print
- Slide
- Spraint
- Trail

- 2018
- 2020
- 2021
- 2022

Data Source: RPS 2018-2023, Atkins 2023

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Kilometres

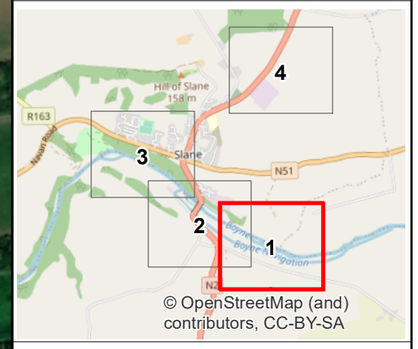

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Figure 17

Otter Evidence
Map 1 of 4

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NOTE:

Legend

- Proposed Scheme
- Proposed Scheme Boundary

Atkins Otter Evidence (2023)

- Couch & spraint
- Holt
- Spraint
- Spraint & slide

RPS Otter Evidence

- Couche
- Fish scales
- Print
- Slide
- Spraint
- Trail

- 2018
- 2020
- 2021
- 2022

Data Source: RPS 2018-2023, Atkins 2023

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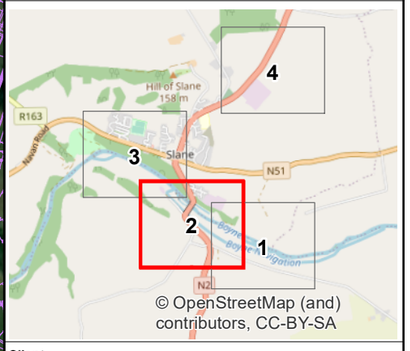

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Figure 17

Otter Evidence
Map 2 of 4

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Legend

- Proposed Scheme
- Proposed Scheme Boundary

Atkins Otter Evidence (2023)

- Couch & spraint
- Holt
- Spraint
- Spraint & slide

RPS Otter Evidence

- Couche
- Fish scales
- Print
- Slide
- Spraint
- Trail

- 2018
- 2020
- 2021
- 2022

Data Source: RPS 2018-2023, Atkins 2023

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Kilometres

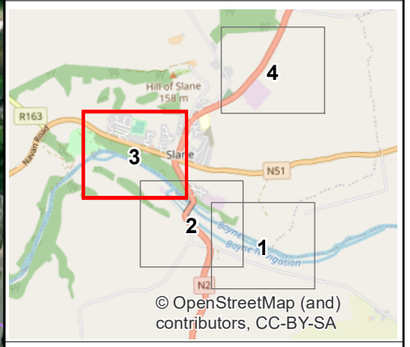

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Figure 17

Otter Evidence
Map 3 of 4

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Legend

- Proposed Scheme
- Proposed Scheme Boundary

Atkins Otter Evidence (2023)

- Couch & spraint
- Holt
- Spraint
- Spraint & slide

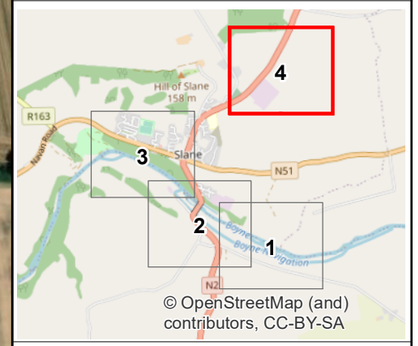
RPS Otter Evidence

- Couche
- Fish scales
- Print
- Slide
- Spraint
- Trail

- 2018
- 2020
- 2021
- 2022

Data Source: RPS 2018-2023, Atkins 2023

0 0.0375 0.075 0.15
Kilometres



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Otter Evidence
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Appendix 1.5

Macroinvertebrate Fauna and Q-Value Analysis

Table 38 and *Table 39* lists macroinvertebrate fauna collected from kick sampling conducted in 2020, 2021 and 2022, covering the River Boyne (Slane Bridge) (2020, 2021) and Thurstianstown Stream (2022). *Table 38* and *Table 39* provides macroinvertebrate data for the Mattock (Mooretown) Stream (2020-2022). Physical habitat data is presented along with resultant Q-values, indicative of biological water quality conditions.

Table 38. Macroinvertebrate Data – River Boyne and Thurstianstown Stream

	EPA Quality Group	Boyne (Slane Br.)	Boyne (Slane Br.)	Thurstianstown Stream
Surveyor		LC	LC	LW
Date		12/08/2020	10/08/2021	19/03/2022
X (ITM)		696312	696312	694991
Y (ITM)		773668	773668	772653
Width (m)		50.0	50.0	1.5
Depth (m)		0.55	0.60	0.15-0.25
Habitat		Glide	Glide	Run-riffle
Shade		Light	Mod.	High
Dominant Substrate		Cobble (30%), gravel (30%), sand (30-40%)		Cobble (60%); pebble (40%)
Siltation		None	None	High
Flow Velocity		Fast	Fast	Slow-Mod.
Discharge		High	High	Average
Macrophyte cover %		10%	12%	0%
Filamentous algae %		2%	0%	0%
MAY FLIES (Ephemeroptera)				
Ephemera danica	A	F	C	
Serratella ignita	C	F	F	
Baetidae	C		F	+
STONE FLIES (Plecoptera)				
Leuctra spp.	B	F		
CADDIS FLIES (Trichoptera)				
Goeridae	B		F	
Sericostoma personatum	B	C	C	
Leptoceridae	B	F		
Odontoceridae	B		F	
Glossosomatidae	C			C
Polycentropidae	C			+
Limnephilidae	C			+/F
TRUE FLIES (Diptera)				
Chironomidae	C	F	F	F
Tipulidae	C	F		
WATER BEETLES (Coleoptera)				
Elmidae	C	F	F	+/F
Dytiscidae	C	C	F	
Haliplidae	C	F	C	
F/W SHRIMPS (Crustacea)				
Gammarus duebeni	C	N	F	D/E
SNAILS (Mollusca)				
Ancyclidae	D	F		
Lymnaea peregra	D		F	
Lymnaea stagnalis	D	F		
Sphaeridae	D		F	
LEECHES (Hirudinea)				
Erpobdella octoculata	D	F		
WORMS (Annelida)				
Oligochaetae (Tubificid)	E		F	

	EPA Quality Group	Boyne (Slane Br.)	Boyne (Slane Br.)	Thurstianstown Stream
		Q3-4	Q4	Q3
Q Value Status		Moderate	Good	Poor

Table 39. Macroinvertebrate Data – River Mattock (Mooretown) Stream

	EPA Quality Group	Mattock (Mooretown) Stream (d/s N2 culvert)		
Surveyor		LC	LC	LW
Date		12/08/2020	10/08/2021	19/03/2022
X (ITM)		697233	697233	697237
Y (ITM)		775302	775302	775302
Width (m)		2.5	3.0	2.2
Depth (m)		0.05	0.10	0.06
Habitat		Riffle-Run	Riffle-Run	Riffle-Run
Shade		Heavy	High/Mod.	High/Mod.
Dominant Substrate		Cobble (50%); Gravel (50%) with layer of silt		
Siltation		V. high	V. high	V. high
Flow Velocity		Slow	Slow	Slow/Mod.
Discharge		<Average	Low	Average
Macrophyte cover %		<1%	<1%	0%
Filamentous Algae %		0%	0%	0%
MAY FLIES (Ephemeroptera)				
Rhithrogenia semicolorata	A			+
Serratella ignita	C		F	
Baetidae	C	C	F	C/N
CADDIS FLIES (Trichoptera)				
Glossosomatidae	C		F	F
TRUE FLIES (Diptera)				
Chironomidae	C	C	C	C
Simuliidae	C	F		F/C
Dicranota	C			
Ceratopoginae	C	F	F	
WATER BEETLES (Coleoptera)				
Elmidae	C	F	F	
F/W SHRIMPS (Crustacea)				
Gammarus duebeni	C	D	N	N
Asellus aquaticus	D		F	+
SNAILS (Mollusca)				
Ancyclidae	D	F		+
Sphaeridae	D			+
LEECHES (Hirudinea)				
Erpobdellidae	D		F	F
Glossiphonia complanata	D			+
WORMS (Annelida)				
Oligochaetae (Tubificid)	E	F	C	F/C
Q-value		Q3	Q2-3	Q3
Q Value Status		Poor	Poor	Poor

+ = Present (one or two); F = Few (1-5%); C = Common (6-20%); N = Numerous (21-50%); D = Dominant (51-75%); E= Excessive (>75%).

Appendix 1.6

Example Daily Water Monitoring Sheet

NIS APPENDIX 1

BOYNE RIVER – MONITORING RECORD						
Sampling Date						
Name of ECoW						
Approximate Antecedent Dry Period (ADP)						
River Flow condition (circle)	High	> Average	Average	< Average	Low	
Sample Location	**Sample Time**	**Turbidity (NTU) (in-situ)**	**pH (in-situ)**	**Conductivity (in-situ)**	**Grab Sample taken? Y/N**	**Comments / Observations**
NORTH BANK						
Boyne Nth US (A)						
Boyne Nth DS (B)						
Boyne Nth DS (C)						
SOUTH BANK						
Boyne Sth US (A)						
Boyne Sth DS (B)						
Boyne Sth DS (C)						
Canal US						
Canal DS						
General Comments / Observations during sampling (e.g., visible turbidity etc.)						