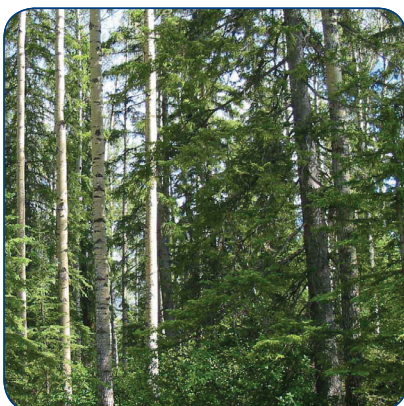


M28 Cork to Ringaskiddy Project

Natura Impact Statement

Volume 3

May 2017





M28 Cork to Ringaskiddy Project

Natura Impact Statement

Document Control Sheet

Client:	Cork County Council
Project Title:	M28 Cork to Ringaskiddy Project
Document Title:	Natura Impact Statement
Document No:	MCT00597RP9030F01

Text Pages:	89	Appendices:	3
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Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F01	Final	10 th May 2017	ED	<i>Ed O'Leary</i>	PK	<i>Paula Keenan</i>	AF	<i>Aisling</i>

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1 INTRODUCTION

1.1 SCOPE

RPS were commissioned by Cork County Council to undertake Screening for Appropriate Assessment (AA) and, as necessary, complete a Natura Impact Statement (NIS) to inform the AA for the proposed M28 Cork to Ringaskiddy Road Project (referred to hereafter as the proposed M28 Road Project). Screening for AA prepared for the proposed M28 Road Project concluded that, on the basis of objective information, the project either individually or in combination with other plans or projects is likely to have significant effects on European sites in view of their conservation objectives. Therefore, the project is subject to an AA in accordance with Article 6(3) of the EU Habitats Directive (Directive 92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora; the Planning and Development Act 2000 (as amended); and the European Communities (Birds and Natural Habitats) Regulations 2011 (S.I. No. 477/2011). The full text of the Screening for AA Report is presented in **Appendix A**.

This document comprises the NIS to facilitate the AA of the proposed M28 Road Project by the competent authority, An Bord Pleanála.

1.2 DESCRIPTION OF THE PROPOSED DEVELOPMENT

Cork County Council (CCC), under the auspices of the National Roads Authority (NRA), known for operational purposes as Transport Infrastructure Ireland (TII) propose to upgrade approximately 12.5km of the N28 National Primary Route from the N28/N40 South Ring Road Bloomfield Interchange to Ringaskiddy in County Cork.

The project comprises a motorway route from the interchange with the N40 (Bloomfield Interchange) to the R613 Carrigaline to Ringaskiddy road at Barnahely. From Barnahely, it comprises a single carriageway which will link to the east side of Ringaskiddy village and be a Protected Road as defined under the Roads Act which will be designated 'Clearway' as defined in the Road Traffic Act (prohibits parking and stopping) in order to meet TEN-T requirements for the Core road network. Together, the Proposed M28 Road Project and the N28 single carriageway national road will form the TEN-T route to the Port of Cork complex at Ringaskiddy. A Service Area (SA) will be located within the Port of Cork lands at this eastern entrance to the Port of Cork facility.

The proposed M28 Road Project is substantially on-line between Bloomfield and Carr's Hill consisting of widening of the existing N28 road. South of Carr's Hill the route extends on the western side of the existing N28 to Shannonpark where it turns in an easterly direction and continues south of the existing road as far as the R613 at Barnahely. From, the R613 junction at Barnahely there will be two routes to Ringaskiddy, one route along the existing R613 to the existing N28 providing access to the western entrance to the Port of Cork, and a second new route comprising a new single carriageway, extending immediately to the south of Ringaskiddy Village which will turn eastwards and access to a proposed new eastern entrance to the Port of Cork facility located on the eastern side of Ringaskiddy Village.

The proposed M28 Road Project is shown in **Figure 1.1** overleaf and is also presented on **Figure 3.1** and **3.2** of this report. The detailed description and background of the proposed road project is provided in **Chapter 1** and **Chapter 3** of the accompanying **Volume 2** Environmental Impact Statement (EIS). Layout and drainage drawings for the project are provided in **Appendix C**.

The scheme consists of the following main elements:

- 10.9km of mainline motorway from Bloomfield to Barnahely;
- 1.5km of mainline single carriageway protected road from Barnahely to east of Ringaskiddy;
- 4.8km of new and realigned regional and local roads;
- 2.2km of accommodation works tracks;
- 1 full grade-separated interchange at Carr's Hill with associated roundabouts, slip roads and widening of the existing underbridge at Carr's Hill;
- 3 partial grade-separated interchanges at Bloomfield/Rochestown Road, Shannonpark and Shanbally, with associated roundabouts and slip roads, including 2 new underbridges, existing bridge at Rochestown retained as part of the scheme;
- 3 at-grade roundabouts at Barnahely, Loughbeg and eastern Port of Cork entrance;
- Provision of a M28 to N40 westbound link road and improvement of the westbound merge from the M28 to the N40;
- Removal of the existing sub-standard northbound on-ramp at Maryborough Hill;
- Upgrading of the existing sub-standard off-ramp to Mount Oval;
- 4 new road underbridges to allow the proposed M28 to pass over existing roads;
- 1 underbridge widening at Carr's Hill;
- 2 shared use pedestrian and cyclist underpasses, one at Carr's Hill and one at Old Post Office Road;
- Demolition of the existing Maryborough Hill overbridge and construction of a replacement overbridge at the same location. This overbridge will take Maryborough Hill over the widened M28 below;
- Various other structures including large retaining walls and stream culverts;
- Traffic signalised control to be implemented at key junctions on Rochestown Road, including the replacement of the Rochestown Road roundabout with a signalised junction, signalling of the merge to the M28 and signalling of the Clarke's Hill junction;
- Local road improvements and parallel access roads, etc;
- Accommodation works and farm accesses as required;
- Provision for footpaths and cycle facilities;
- Relocation of high voltage electricity pylons at Shanbally;
- Drainage system, including attenuated outfalls, watercourse culverts and realignments;
- Landscaping and environmental mitigation measures; and
- A Service Area for commercial vehicles including amenity building, fuel facilities, parking etc. within the Port of Cork lands at Ringaskiddy.

Figure 1.1: Location and Extent of Proposed M28 Road Project



The need for the Proposed M28 Road Project derives from the requirements of European and National Transportation and Port Access policies and is strongly underpinned in national, regional and local planning policy. The policy basis for the need for the Proposed M28 Road Project is set out in more detail in **Chapter 2: Planning and Policy Context** of the EIS contained in **Volume 2**.

1.3 STUDY AREA AND ZONE OF INFLUENCE

The proposed M28 Road Project will comprise a motorway from the Bloomfield Interchange to Barnahely with a single-carriageway from Barnahely to the eastern side of Ringaskiddy.

Determination of this project's Zone of Influence (Zoi) was achieved by assessing the project's requirements and deliverables against the ecological receptors within the project footprint, in addition to all ecological receptors that could be connected to and subsequently impacted by the project through abiotic and biotic vectors. To this end, the Zoi extends outside of the proposed road project footprint to include ecological receptors connected to the project through overlap / intersection, proximity and connectivity through features such as watercourses.

The proposed M28 Road Project is not located within sites designated for nature conservation, however the project supports connectivity with two European sites; Great Island Channel Special Area of Conservation SAC (Site Code: 001058) and Cork Harbour SPA (Site Code: 004030) (See **Figure 3.1**)

Designated sites, habitats, flora and fauna protected under Irish statute are assessed in full in **Chapter 12** of the accompanying EIS contained in **Volume 2**.

1.4 FINDINGS OF SCREENING FOR APPROPRIATE ASSESSMENT

Screening for Appropriate Assessment was undertaken for this project in Q1 2015 and was subsequently reviewed and updated in Q2 2017. This assessment concluded that two European sites are present within the Zoi including Cork Harbour SPA (Site Code: 004030) and Great Island Channel SAC (001058). At its closest point, Cork Harbour SPA is located 55m north (See **Table 3.1**) and the proposed road project supports indirect connectivity to Cork Harbour SPA via three watercourses. In addition, the screening for AA highlighted that the proposed M28 Road Project may present potential disturbance impacts to avifaunal feeding grounds north of the Lough Beg area designated as part of Cork Harbour SPA.

Bird surveys completed during the over-wintering season of 2014/15 highlighted that expansive pastoral fields located to the north of Lough Beg supported field feeding shorebirds which constitute the Special Conservation Interests (SCI) of Lough Beg and Cork Harbour SPA. Further over-wintering avifaunal surveys were required, given the uncertainty as to the suitability and importance of these habitats as viable and integral feeding sources for species associated with Cork Harbour SPA.

Given this uncertainty and the need for further survey and assessment, it was deemed that the proposed M28 Road Project could not be screened out for AA and that a NIS be completed to inform the AA. Great Island Channel SAC supports remote and tenuous connectivity with the proposed M28

Road Project, through the waters of Cork Harbour. Potential impacts to the Great Island Channel SAC are also considered as part of this NIS.

1.5 NIS OBJECTIVES

This NIS considers impacts to Cork Harbour SPA focusing on the avifaunal field feeding areas to the north of Lough Beg, proximal to the proposed M28 Road Project. The suitability and importance of these areas to bird species and populations associated with Cork Harbour SPA will be considered. Other potential impacts such as the release of air and water borne pollutants to sensitive habitats and watercourses draining the study area which provide connectivity with Cork Harbour SPA and Great Island Channel SAC is also considered in this assessment.

2 METHODOLOGY

2.1 LEGISLATIVE BACKGROUND FOR APPROPRIATE ASSESSMENT

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 legal protection for habitats and species of European importance.

European sites are defined under the Habitats Directive (Article 3) as a coherent European ecological network of special areas of conservation, composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range. In Ireland these sites are designated as European Sites and include Special Protection Areas (SPAs), established under the EU Birds Directive (79/409/EEC, as codified by 2009/147/EC) for birds and Special Areas of Conservation (SACs), established under the Habitats Directive 92/43/EEC for habitats and species.

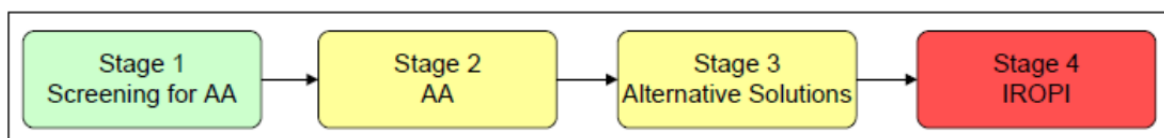
As part of the application for Approval under Section 51 of the Roads Acts, An Bord Pleanála, in its role as the Competent Authority in carrying out the AA, is obliged to examine the likely significant effects, individually or in combination with other plans and projects, of the proposal on European sites in light of their specific qualifying interests and conservation objectives. If screening determines that there is likely to be significant effects on a European Site, then a Stage 2 AA must be carried, including the compilation of a NIS to inform the decision making.

2.2 STAGES OF THE APPROPRIATE ASSESSMENT

The Department of the Environment, Heritage and Local Government guidelines¹ (DoELHG, 2009, rev 2010) outlines the European Commission’s methodological guidance (EC, 2002) promoting a four-stage process to complete the AA, and outlines the issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

The four stages are summarised diagrammatically in **Figure 2.1**. Stages 1-2 deal with the main requirements for assessment under Article 6(3). Stage 3 may be part of the Article 6(3) Assessment or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

Figure 2.1: Four Stages of Appropriate Assessment²



Stage 1 Appropriate Assessment

¹ Now the Department of Housing Planning Community and Local Government

² IROPI – Imperative Reasons for Overriding Public Interest

Stage 1 AA comprises the Screening process that addresses and records the reasoning and conclusions in relation to the first two tests of Article 6(3) as follows:

- i. whether a plan or project (in this instance the proposed M28 Road Project) is directly connected to or necessary for the management of the European sites, and
- ii. whether a plan or project, alone or in combination with other plans and projects, is likely to have significant effects on the European sites in view of their conservation objectives.

If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA).

Stage 2: Appropriate Assessment

The aim of the stage 2 AA process is to identify any adverse impacts that the plan or project might have on the integrity of relevant European Sites. As part of the assessment, a key consideration is 'in combination' effects with other plans or projects. Where adverse impacts are identified, mitigation measures can be proposed that would avoid, reduce or remedy any such negative impacts and the plan or project can be amended and / or conditions and restrictions imposed.

This NIS informs Stage 2 of the AA process and determines if the project is likely to affect the integrity (structure and function) of European sites. As the screening process identified that potential impacts to Cork Harbour SPA and Great Island Channel SAC are unknown, uncertain or cannot be ruled out without further assessment, then an AA is required.

The NIS represents a detailed, targeted assessment of the nature and potential significance of direct and indirect impacts arising from the proposed project. An assessment of cumulative impacts (both from the project objectives, and other policies, plans and programmes) is also completed as part of the NIS. The NIS also incorporates best practice and mitigation measures to eliminate potential adverse impacts.

This NIS has been prepared having regard to the following guidance and legislation:

Guidance

- Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities (DoEHLG 2009, rev 2010a),
- Department of Environment Heritage and Local Government Circular NPWS 1/10 and PSSP 2/10 on Appropriate Assessment under Article 6 of the Habitats Directive – Guidance for Planning Authorities. Department of the Environment, Heritage and Local Government (DoEHLG, 2010b),
- 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 (EC, 2000),
- *Communication from the Commission on the Precautionary Principle*. Office for Official Publications of the European Communities, Luxembourg (EC, 2000a),
- 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 (EC, 2002),
- NRA (2009) Guidelines for the Assessment of Ecological Impacts of National Road Schemes Rev. 2. National Roads Authority (NRA, 2009),

- Interpretation Manual of European Union Habitats. Version EUR 28. European Commission 2013, and
- *Nature and biodiversity cases: Ruling of the European Court of Justice*. Office for Official Publications of the European Communities, Luxembourg (EC, 2006).

Legislation

- The European Union (Environmental Impact Assessment and Habitats) Regulations 2011 (as amended),
- The European Communities (Birds and Natural Habitats) Regulations 2011 (as amended), and
- The Planning and Development Act 2000-2016 including Part XAB thereof.

3 EUROPEAN SITES WITHIN PROJECT ZONE OF INFLUENCE

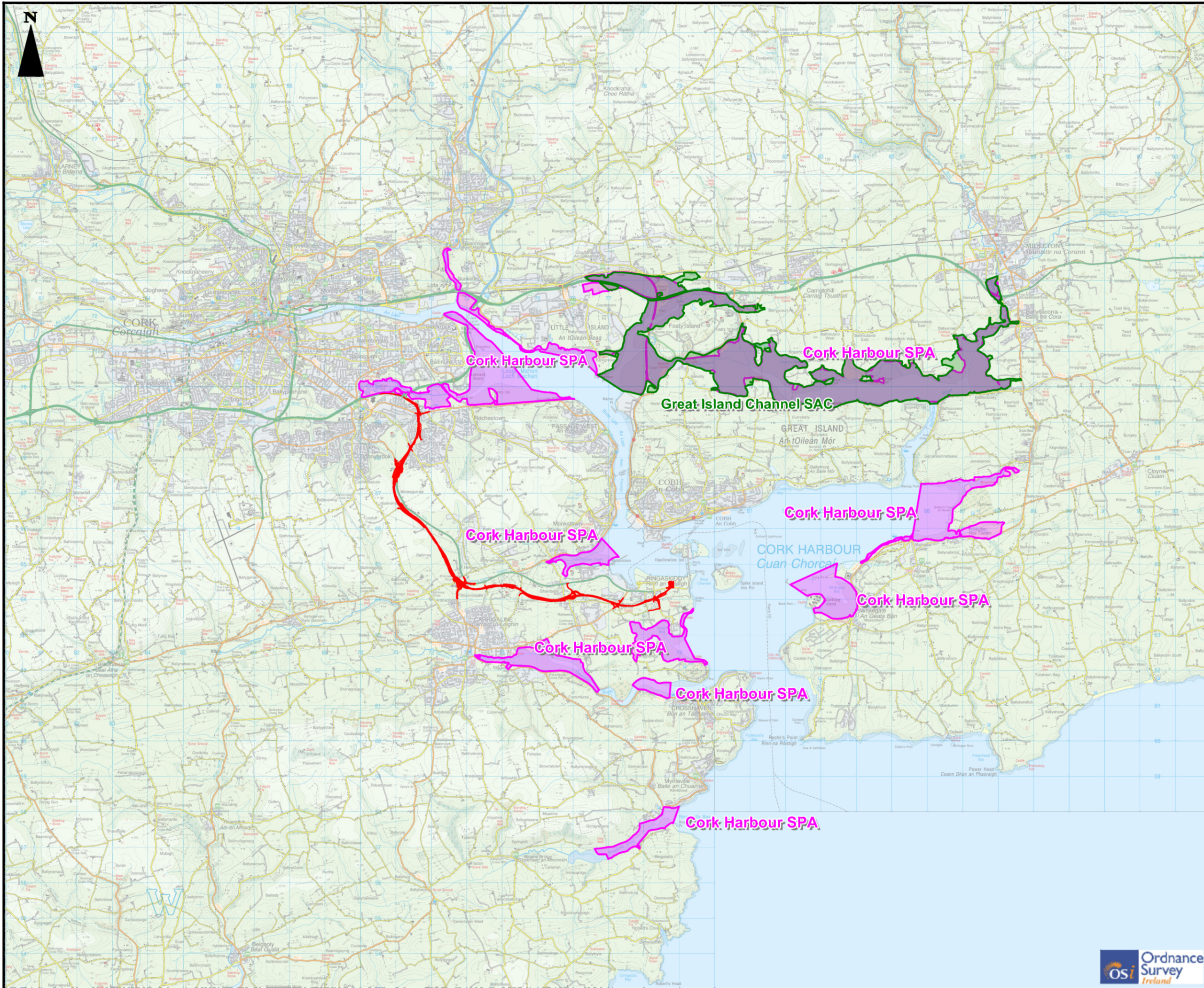
The findings of the Screening for AA concluded that two European sites; Cork Harbour SPA and Great Island Channel SAC are located within the ZOI of the proposed M28 Road Project.

Table 3.1 lists the European sites and their proximity and connectivity to the proposed M28 Road Project. **Figure 3.1** outlines the location of these European sites relative to the proposed M28 Road Project footprint.



Table 3.1: Connectivity of European Sites within 15km of the Proposed M28 Road Project

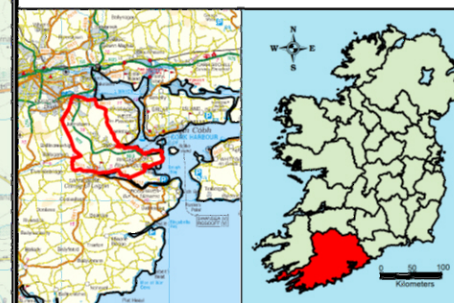
European Site	Distance from the proposed M28 Road Project ³	Connectivity
Great Island Channel SAC	5.1km east	Tenuous through open waters of Cork Harbour SPA.
Cork Harbour SPA	<ul style="list-style-type: none"> ▪ Monkstown Creek – 196m north ▪ Lough Beg – 356m south ▪ Douglas Estuary – 30m north 	<p>Indirect through watercourses draining the proposed M28 Road Project alignment. These are as follows:</p> <ul style="list-style-type: none"> ▪ Glounatouig Stream draining to Monkstown Creek, ▪ Donnybrook Stream draining to Douglas River Estuary, ▪ Woodbrook Stream draining to Douglas River Estuary, <p>The operational phase of the project will support hydrological connectivity to Lough Beg and Douglas River Estuary via outfalls discharging to the marine environment.</p>

³ The proposed M28 Motorway Scheme is located within proximity to three sections of Cork Harbour SPA; Monkstown Creek, Lough Beg and Douglas Estuary. The distances quoted represent the closest point each section of Cork Harbour SPA.



Legend

-  Proposed M28 Road Project
-  Special Area of Conservation (SAC)
-  Special Protection Area (SPA)



Client



Project

M28 CORK TO RINGASKIDDY PROJECT

Title

European Sites within Zone of Influence of the proposed M28 Road Project

Figure: 3.1



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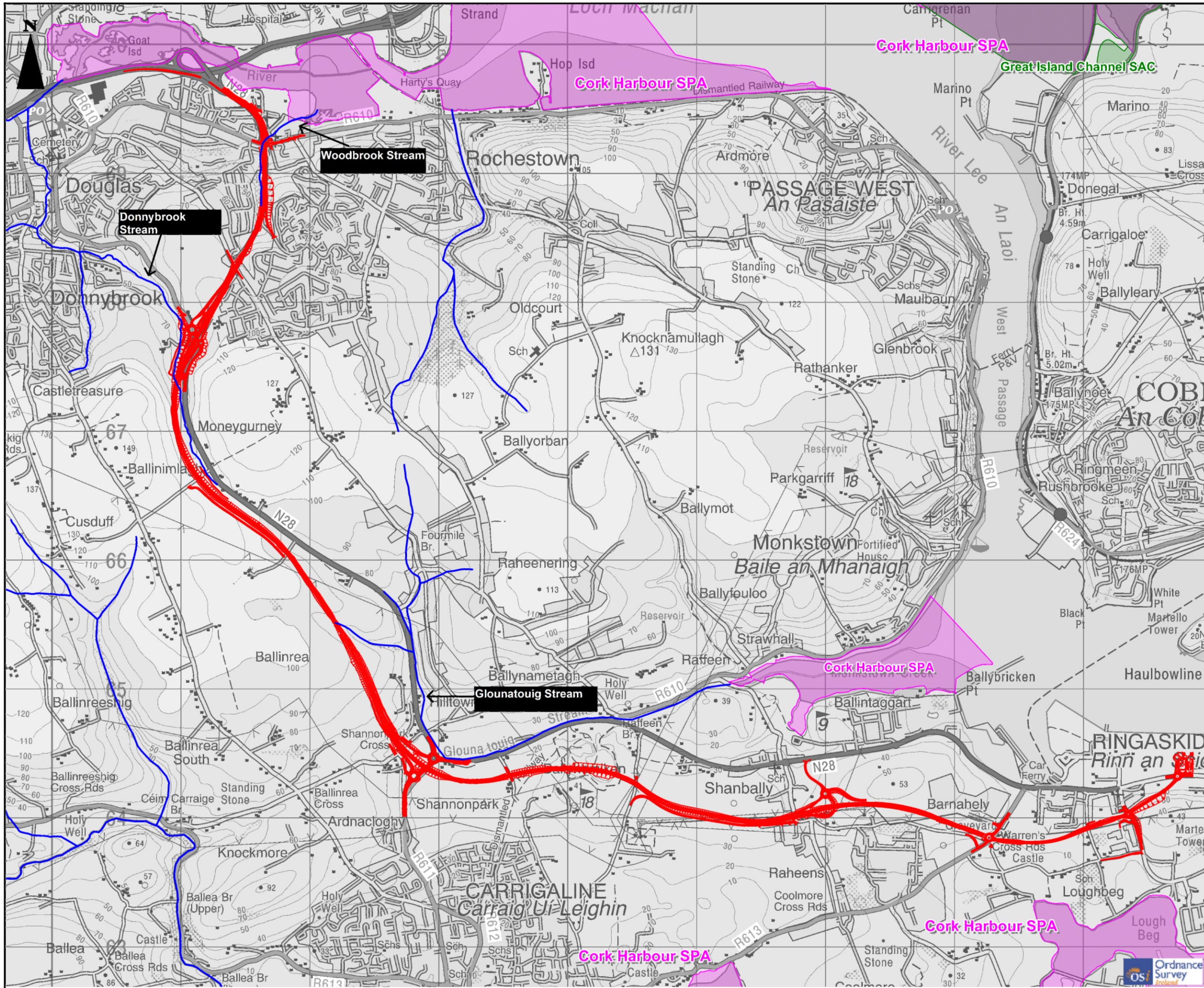
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Legend

- Proposed M28 Road Project
- EPA River Network
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

Client

Project

M28 CORK TO RINGASKIDY PROJECT

Title

European Sites proximate to Proposed M28 Road Project and Watercourses

Figure: 3.2

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3.1.1 Conservation Objectives of European sites

European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status areas designated as SAC and SPA. The Government and its agencies 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, and
- 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 Qualifying Interest (QI) of SACs or the Special Conservation Interest (SCI) of SPAs. The QIs and SCIs for each site have been obtained through a review of the most recently published (web-published or otherwise) QIs, Special SCIs, Conservation Objectives (COs) and Site Specific Conservation Objectives (SSCOs) (where applicable) for these European sites. The data is summarised in **Table 3.2** and **Section 3.1.2** and was the most up-to-date information available at the time of drafting this report in February 2017.

Table 3.2: Qualifying Interests, Special Conservation Interests and Conservation Objectives of the European Sites Being Considered

Qualifying Interest	Conservation Objective	Site Specific Conservation Objectives
24 no. Features of Cork Harbour SPA (IE:004030)		
Little Grebe (<i>Tachybaptus ruficollis</i>) (A004) Great Crested Grebe (<i>Podiceps cristatus</i>) (A005) Cormorant (<i>Phalacrocorax carbo</i>) (A017) Grey Heron (<i>Ardea cinerea</i>) (A028) Shelduck (<i>Tadorna tadorna</i>) (A048) Wigeon (<i>Anas penelope</i>) (A050) Teal (<i>Anas crecca</i>) (A052) Pintail (<i>Anas acuta</i>) (A054) Shoveler (<i>Anas clypeata</i>) (A056) Red-breasted Merganser (<i>Mergus serrator</i>)	To maintain the favourable conservation condition of SCI species for which Cork Harbour SPA is designated. The favourable conservation condition for each species is defined by the list of attributes and targets presented in Table 3.4 .	NPWS (2014a) Conservation Objectives: Cork Harbour SPA (Site Code: 004030). Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. December 2014

Qualifying Interest	Conservation Objective	Site Specific Conservation Objectives
(A069) Oystercatcher (<i>Haematopus ostralegus</i>) (A130) Golden Plover (<i>Pluvialis apricaria</i>) (A140) Grey Plover (<i>Pluvialis squatarola</i>) (A141) Lapwing (<i>Vanellus vanellus</i>) (A142) Dunlin (<i>Calidris alpina alpina</i>) (A149) Black-tailed Godwit (<i>Limosa limosa</i>) (A156) Bar-tailed Godwit (<i>Limosa lapponica</i>) (A157) Curlew (<i>Numenius arquata</i>) (A160) Redshank (<i>Tringa totanus</i>) (A162) Black-headed Gull (<i>Chroicocephalus ridibundus</i>) (A179) Common Gull (<i>Larus canus</i>) (A182) Lesser Black-backed Gull (<i>Larus fuscus</i>) (A183) Common Tern (<i>Sterna hirundo</i>) (A193) Wetlands (A999)		
2 no. Features of Great Island Channel SAC (IE: 001058)		
Mudflats and sandflats not covered by seawater at low tide (1140) Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>) (1330)	To maintain the favourable conservation condition of Annex I habitats of Great Island Channel SAC, which is defined by a list of attributes and targets as outlined in Table 3.3 .	NPWS (2014b) Conservation Objectives: Great Island Channel SAC (Site Code: 001058). Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. June 2014

3.1.2 Site Specific Conservation Objectives

3.1.2.1 Great Island Channel SAC

The Great Island Channel stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. It is an integral part of Cork Harbour which contains several other sites of conservation interest. Geologically, Cork Harbour consists of two large areas of open water in a limestone basin, separated from each other and the open sea by ridges of Old Red Sandstone. Within this system, Great Island Channel forms the eastern stretch of the river basin and, compared to the rest of Cork Harbour, is relatively undisturbed. Within the site is the estuary of the Owennacurra and Dungourney Rivers. These rivers, which flow through Midleton, provide the main source of freshwater to the North Channel (NPWS, 2014c).

The site is a SAC selected for the following habitats listed on Annex I of the E.U. Habitats Directive:

- Tidal Mudflats and Sandflats (1140), and
- Atlantic Salt Meadows (1130).

Site specific conservation objectives were published in June 2014 for Great Island Channel SAC (NPWS, 2014b). This document provides specific attributes and targets by which the maintenance of favourable conservation condition of qualifying interests within Great Island Channel SAC is measured. Site specific Conservation Interests for Great Island Channel SAC are reproduced in **Table 3.3**.

Table 3.3: Site-Specific Attributes and Targets for Annex I Qualifying Habitats of Great Island Channel SAC (NPWS, 2014b)

Conservation Objectives of Great Island Channel SAC			
Mudflats and Sandflats Not Covered by Seawater at Low Tide (1140)			
Attribute	Measure	Target	Notes
Habitat Area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes	Habitat area was estimated using as 723ha using OSi data
Community Distribution	Hectares	Conserve the following community type in a natural condition: Mixed sediment to sandy mud with polychaetes and oligochaetes community complex.	Based on intertidal and subtidal surveys undertaken in 2006 (Aquafact, 2007) and 2011 (EcoServe, 2012; MERC, 2012).
Atlantic Salt Meadows (<i>Glauco-Puccinellietalia Maritimae</i>) (1330)			
Attribute	Measure	Target	Notes
Habitat Area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Bawnard - 0.29ha; Carrigtohill - 1.01ha. See map 5	Based on data from Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Two sub-sites that supported Atlantic salt meadow were mapped (1.30ha) and additional areas of potential saltmarsh (17.60ha) were identified from an examination of aerial photographs, giving a total estimated area of 18.90ha. Saltmarsh habitat has also been recorded at two other sub-sites within the SAC (Curtis and Sheehy Skeffington, 1998). Further un-surveyed areas maybe present within the SAC. See coastal habitats supporting document for further details
Habitat Distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 5 for known distribution	Based on data from McCorry and Ryle (2009). Within the sites surveyed by the SMP, estuary type saltmarsh over a mud substrate is most common and Atlantic Salt Meadows (ASM) is the dominant saltmarsh habitat. Further unsurveyed areas maybe present within the SAC. See coastal habitats supporting document for further details
Physical	Presence / absence	Maintain/restore natural circulation of sediments and	Based on data from McCorry and Ryle (2009). At Bawnard there is a seawall

Conservation Objectives of Great Island Channel SAC			
Structure: Sediment Supply	of physical barriers	organic matter, without any physical obstructions	that was constructed in the 18th-19th centuries. At Carrigatohil the northern and eastern shorelines have been significantly modified by road construction. Part of the saltmarsh has also been infilled. See coastal habitats supporting document for further details
Physical Structure: Creeks and Pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). The ASM at Carrigatohil is poorly developed, though some of the larger sections contain salt pans. The smaller sections, however, tend to be quite uniform in topography. The saltmarsh topography at Bawnard is poorly developed with few typical saltmarsh features. See coastal habitats supporting document for further details.
Physical Structure: Flooding Regime	Hectares flooded; frequency	Maintain natural tidal regime	Based on data from McCorry and Ryle (2009). At Bawnard, the entire bay empties at low tide to expose soft intertidal mudflats. See coastal habitats supporting document for further details
Vegetation Structure: Zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). Zonation to <i>Salicornia</i> flats and intertidal mudflats occurs at Carrigatohil. At Bawnard, there is succession from saltmarsh to brackish saltmarsh and wet grassland as well as zonation to intertidal mudflats at the lower saltmarsh boundary. See coastal habitats supporting document for further details
Vegetation Structure: Vegetation Height	Centimetres	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). At Carrigatohil, the sward height is quite tall due to lack of grazing. At Bawnard only part of the site is grazed. See coastal habitats supporting document for further details
Vegetation Structure: Vegetation Cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% area outside creeks vegetated	Based on data from McCorry and Ryle (2009). Some poaching was noted in places at Bawnard. See coastal habitats supporting document for further details
Vegetation Composition: Typical Species and Sub- Communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in SMP (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation	Hectares	No significant expansion of	Based on data from McCorry and Ryle

Conservation Objectives of Great Island Channel SAC			
Structure: Negative Indicator Species <i>Spartina Anglica</i>	–	common cordgrass (<i>Spartina anglica</i>), with an annual spread of less than 1% where it is known to occur	(2009). <i>Spartina</i> occurs at both sub- sites in this SAC. See coastal habitats supporting document for further details

3.1.2.2 Cork Harbour SPA

Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Douglas, Owenboy and Owennacurra. The SPA site comprises most of the main intertidal areas of Cork Harbour, including all of the North Channel, the Douglas River Estuary, inner Lough Mahon, Monkstown Creek, Lough Beg, the Owenboy River Estuary, Whitegate Bay, Ringabella Creek and the Rostellan and Poul nabibe inlets. The site is of major ornithological significance, being of international importance both for the total numbers of wintering birds (i.e. > 20,000) and also for its populations of Black-tailed Godwit and Redshank. In addition, it supports nationally important wintering populations of 22 species, as well as a nationally important breeding colony of Common Tern. Several of the species which occur regularly are listed on Annex I of the EU Birds Directive, i.e. Whooper Swan, Little Egret, Golden Plover, Bar-tailed Godwit, Ruff, Mediterranean Gull and Common Tern. The site provides both feeding and roosting sites for the various bird species that use it. Cork Harbour is also a Ramsar Convention site and part of Cork Harbour SPA is a Wildfowl Sanctuary (NPWS, 2015).

Site specific Conservation Objectives were published for Cork Harbour SPA in December 2014. This document provides specific attributes and targets by which the maintenance of favourable conservation condition of qualifying interests within Cork Harbour SPA are measured Site specific Conservation Interests for Great Island Channel SAC are reproduced in **Table 3.4**.

Table 3.4: Site-Specific Conservation Objectives, Attributes and Targets for Qualifying Habitats of Cork Harbour SPA (NPWS, 2014a)

Over-Wintering Bird Populations for Cork Harbour SPA			
Conservation Objective: To maintain the favourable conservation condition of the following over-wintering species in Cork Harbour SPA (Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Black-headed Gull, Common Gull, Lesser Black-backed Gull) which is defined by the following list of attributes and targets:			
Attribute	Measure	Target	Notes
Population Trend	Percentage Change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by these species other than that occurring from natural patterns of	Waterbird distribution from 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

Over-Wintering Bird Populations for Cork Harbour SPA			
		variation	
Conservation Objective: To maintain the favourable conservation condition of the following breeding species in Cork Harbour SPA (Common Tern), which is defined by the following list of attributes and targets:			
Attribute	Measure	Target	Notes
Breeding Population Abundance: Apparently Occupied Nests (AONs)	Number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995). Wilson et al. (2000) provides background summary population information for the Cork Harbour area. In 2012 the total population of common terns that nested within the wider Cork Harbour was between 85 and 95 pairs, a proportion of which now breeds outside the SPA (RPS, 2014)
Productivity Rate: Fledged Young Per Breeding Pair	Mean number	No significant decline	Measure based on standard tern survey methods (see Walsh et al., 1995). The Seabird Monitoring Programme (SMP) (JNCC, 2014) provides population data for this species
Distribution: Breeding Colonies	Number; location; area (hectares)	No significant decline	Common tern breeding colonies can be sited in both coastal and inland areas using a wide variety of habitats including sandy, rocky or well-vegetated islands in estuaries, lakes and rivers. This species can also use artificial substrates (Del Hoyo et al., 1996). First recorded nesting in saltmarsh in 1969-70 (Smiddy, 1985), the colony now largely breeds on artificial structures in at least two locations (see Wilson et al., 2000 and RPS, 2014)
Prey Biomass Available	Kilogrammes	No significant decline	Key prey items: Small fish, crustaceans, insects and occasionally squid. Key habitats: common tern forage in/shallow coastal waters, bays, inlets, shoals, tidal-rips, drift lines, beaches, saltmarsh creeks, lakes, ponds or rivers. Foraging range: max. 37km, mean max. 33.81km, mean 8.67km (Birdlife International Seabird Database (Birdlife International, 2014))
Barriers to Connectivity	Number; location; shape; area (hectares)	No significant increase	Seabird species can make extensive use of marine waters adjacent to their breeding colonies. Foraging range: max. 37km, mean max. 33.81km, mean 8.67km (BirdLife International Seabird Database

Over-Wintering Bird Populations for Cork Harbour SPA			
			(Birdlife International, 2014))
Disturbance at the Breeding Site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding common tern population	In the Cork Harbour area, this species largely breeds on artificial structures (see Wilson et al., 2000 and RPS, 2014)
Conservation Objective: To maintain the favourable conservation condition of the wetland habitat in Cork Harbour SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:			
Attribute	Measure	Target	Notes
Wetland Habitat Area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 2,587 hectares, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 2,587ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document

3.1.3 Threats and Pressures to European Sites

Threats and pressures to the Great Island Channel SAC and Cork Harbour SPA are presented in **Table 3.5 to Table 3.7** below.

Table 3.5: Negative Threats, Pressures and Activities with impacts to the Great Island Channel SAC

Threats and Pressures (Code) ⁴	Threat Type	Rank ⁵	Inside(i) / Outside (o) / Both (b)
E01	Urbanised areas, human habitation	H	o
D01.02	Roads, motorways	H	i
F01	Marine and freshwater aquaculture	H	i
A08	Fertilisation	M	o
A04	Grazing	M	i
K02.03	Eutrophication (natural)	M	i
J02.01.02	Reclamation of land from sea, estuary or marsh	H	i
I01	Invasive non-native species	M	i

⁴ Threat code sourced from Natura 2000 data form and follows reference list provided on threats, pressures and activities for European sites

⁵ Threat, pressure and impact ranking provided on Natura 2000 data form: H – High, M – Medium, L - Low

Table 3.6: Negative Threats, Pressures and Activities with impacts to Cork Harbour SPA

Threats and Pressures (Code)	Threat Type	Rank	Inside (i) / Outside (o) / Both (b)
E01.03	Dispersed habitation	L	o
D01.02	Roads, motorways	H	o
G01.02	Walking, horse-riding and non-motorised vehicles	M	i
F02.03	Leisure fishing	M	i
D03.01	Port areas	H	o
A08	Fertilisation	M	o
F01	Marine and freshwater aquaculture	H	i
G01.01	Nautical sports	M	i
E01	Urbanised areas, urban habitation	H	o
G01.06	Skiing, off-piste	M	i
E02	Industrial or commercial areas	H	o
D03.02	Shipping lanes	M	i

Table 3.7: Positive Threats, Pressures and Activities with impacts to Cork Harbour SPA

Threats and Pressures (Code)	Threat Type	Rank	Inside (i) / Outside (o) / Both (b)
F02.03	Leisure Fishing	M	i
F01	Marine and Freshwater Aquaculture	H	i
E01.03	Dispersed Habitation	L	o
D03.02	Shipping Lanes	M	i
G01.01	Nautical Sports	M	i

3.1.4 Conservation Condition of Special Conservation Interests for Cork Harbour SPA

The Conservation Objectives Supporting document for Cork Harbour SPA (NPWS, 2014a) provides a review of the site conservation condition and population trends for Cork Harbour SPA with regard to species' all-Ireland and international trends (see **Table 3.8**). All-Ireland trends follow Crowe & Holt (2013) while International trends follow Wetlands International (2012).

Table 3.8: SCI Species of Cork Harbour SPA – Current Site Conservation Condition

Special Conservation Interests	BoCCI Category ⁶	Site Population Trend ⁷	Site Conservation Condition	Current All-Ireland Trend ⁸	Current International Trend ⁹
Shelduck	Amber	- 39	Unfavourable	Stable	Increasing
Wigeon	Red	- 27	Unfavourable	Declining	Stable
Teal	Amber	- 1	(Intermediate) Unfavourable	Stable	Increasing
Pintail	Red	- 65	Highly Unfavourable	Increasing	Increasing
Shoveler	Red	- 75	Highly Unfavourable	Increasing	Increasing
Red-breasted Merganser	Green	- 51	Highly Unfavourable	Stable	n/c
Little Grebe	Amber	+ 16	Favourable	Stable	Increasing
Great Crested Grebe	Amber	- 46	Unfavourable	Declining	Declining?
Cormorant	Amber	- 50	Highly Unfavourable	Stable	Increasing
Grey Heron	Green	- 15	(Intermediate) Unfavourable	Stable	Increasing
Oystercatcher	Amber	- 20	(Intermediate) Unfavourable	Stable	Declining
Golden Plover	Red	+ 21	Favourable	Declining	Declining
Grey Plover	Amber	- 68	Highly Unfavourable	Declining	Declining?
Lapwing	Red	- 68	Highly Unfavourable	Declining	Stable
Dunlin	Red	- 49	Unfavourable	Declining	Stable
Black-tailed Godwit	Amber	+ 16	Favourable	Increasing	Increasing
Bar-tailed Godwit	Amber	+ 41	Favourable	Stable	Increasing
Curlew	Red	-44	Unfavourable	Declining	Declining
Redshank	Red	-29	Unfavourable	Stable	Stable/Increasing?
Black-headed Gull	Red	- 53	Highly Unfavourable	n/c	n/c
Common Gull	Amber	- 89	Highly Unfavourable	n/c	n/c
Lesser Black-backed Gull	Amber	- 83	Highly Unfavourable	n/c	n/c

⁶After Colhoun & Cummins, 2013

⁷Site population trend analysis

⁸All-Ireland trend - where a species is deemed to be increasing or declining if the annual rate of change is equal to or greater than 1.2% (after Crowe & Holt, 2013)

⁹Current international trend after Wetlands International (2012).

Table 3.8 also shows the relationship between a species' long-term site trend and the current All-Ireland trend for the period 1999/00 to 2010/11. The colour coding used represents the following cases:-

- **Grey** – un-assessed;
- **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 a 1.0 – 24.9% decline at site level but are stable or increasing at all-Ireland level;
- **Pink** - species whose populations are exhibiting a 25.0 – 49.9% decline at site level but are stable or increasing at all-Ireland level; and
- **Red** - species whose populations are exhibiting a decline of >50.0% at site level but are stable or increasing at all-Ireland level.

The pink and red categories display where populations are stable or increasing at All-Ireland level, but where significant declines are observed at a site level within Cork Harbour SPA. Leech *et al.* (2002) suggests that site-based management issues may be responsible for such patterns in the observed declining site population trends.

4 EXISTING ENVIRONMENT

The proposed M28 Road Project is located between the settlements of Douglas, Carrigaline and Ringaskiddy, Co. Cork. The majority of the route will span extensive areas of farmland comprising arable land and improved agricultural grassland. The northernmost sections of the scheme are located within the Douglas area and are flanked by mixed broadleaved woodland within the Mulcan Valley area. South of the Mulcan Valley, the proposed M28 Road Project spans open and expansive farmland to Shannonpark, before turning east through the townlands of Shannonpark, Raffeen, Barnahely and Ringaskiddy. In addition to pastoral and arable lands, the proposed Road Project will also intersect treelines, hedgerows, small areas of woodland and scrub. At Raffeen Quarry, the scheme will traverse a mosaic of high quality semi-natural habitats that include dry calcareous and neutral grassland, other artificial lakes and ponds and scrub that have established at this quarry.

The proposed M28 Road Project is drained by three watercourses including the Donnybrook Stream, the Woodbrook Stream and the Glounatouig Stream. All of these watercourses provide connectivity between the proposed M28 Road Project and Cork Harbour SPA and through the waters of Cork Harbour, remote and tenuous connectivity to Great Island Channel SAC. Both the Glounatouig Stream and the Donnybrook Stream provide connectivity to the Douglas River Estuary which is designated as part of Cork Harbour SPA. The areas south of Ballinrea and Hilltown and those areas east of Shannonpark and Raffeen are drained by the Glounatouig Stream which flows into Monkstown Creek. Monkstown Creek is also designated as part of Cork Harbour SPA.

The central portion of the study area is located within the Ballinhassig Groundwater Body. This groundwater body is composed of the lower permeability sandstones and mudstones and experiences higher runoff from the ridges and higher ground. The bedrock forms a Locally Important Aquifer which is moderately productive only in local zones (LI). Groundwater flow paths in this area are expected to be short (30 to 300m) with groundwater discharging to small springs or streams.

With the exception of the Glounatouig Stream, the general lack of surface water drainage features in the area between Shannonpark and Ringaskiddy indicates good drainage, possibly owing to shallow soil depths, the nature of mineral till deposits and high permeability in the bedrock. There are reported to be springs in the area ranging from small to large with reliable discharges. There is expected to be a high degree of interconnection between the groundwater and surface water in the area with groundwater being discharged to springs and to rivers in the area.

Bird surveys completed during the over-wintering season of 2014/15 to inform the Screening for AA highlighted that expansive pastoral fields located to the north of Lough Beg supported intermittent occurrences of overwintering field feeding shorebirds that are SCI of Cork Harbour SPA. Further over-wintering avifaunal surveys were required, given the uncertainty as to the suitability and importance of these habitats as viable and integral feeding sources for SCI species associated with Cork Harbour SPA.

Common Tern is also an SCI for Cork Harbour SPA. Breeding grounds for Common Tern breeding habitat associated with Cork Harbour SPA within the project zone of influence include Ringaskiddy Port and Monkstown Creek. The proposed M28 Road Project is not located in proximity or does not support potential interconnectivity with these sites.

The methodology for field surveys focused on capturing data pertaining to the wintering SCI avifauna of the SPA are provided in the following sections.

4.1 METHODOLOGY

4.1.1 Wintering Avifaunal Surveys

Given the proximity and interconnectivity between the proposed M28 Road Project and Cork Harbour SPA, two over-wintering avifaunal surveys were completed by Glas Ecology in 2014/15 and Dr. Tom Gittings 2015/16, to ascertain the level of avifaunal usage within the footprint of the proposed M28 Road Project and whether the proposed M28 Road Project and its environs supported suitable feeding or roosting over-wintering habitat for avifauna associated with the nearby sections of Cork Harbour SPA.

Surveys completed included line transect surveys of the proposed route footprint and its environs, in addition to surveys on expansive arable and pastoral lands north of Lough Beg to confirm their viability as significant feeding areas for SCI of Cork Harbour SPA. The over-wintering avifaunal surveys completed for the scheme are presented in **Appendix B**.

4.1.1.1 Line Transect Surveys

Line transect surveys were completed along the proposed M28 Road Project route. The transect counts used the standard Countryside Bird Survey (CBS) methodology (BirdWatch Ireland, 2012) and involved recording birds separately in three distance bands (0-25 m, 25-100 m and > 100 m), as well as overflying birds. Seven transect sections covering the extent of the proposed route were surveyed during the winter of 2014/ 2015 and again in 2015/2016. Any additional notable bird species detected on return walks along the transect route were also recorded separately.

4.1.1.2 Field Feeding Surveys

As part of the consultation process for the scheme, NPWS requested field studies to be undertaken to determine the value of the pastoral lands to north of Lough Beg to over-wintering avifauna. Field feeding wader surveys were also completed to investigate whether there is any evidence that motorway schemes deter species such as Curlew, SCI species for Cork Harbour SPA, from flying over roads to reach feeding areas, as the proposed road project may lead to fragmentation of suitable feeding habitat.

Given the relative proximity of the proposed M28 Road Project to Lough Beg and its potential overlap with field feeding areas north of this area, surveys of those expansive pastoral and arable areas located to the north of Lough Beg were completed during the winters of 2014 / 2015 and 2015 / 2016. Key field feeding areas north of Lough Beg were established by undertaking monthly counts during the winters of 2014/2015 and 2015/2016. In 2014/15 counts were undertaken within four hours of high tide (i.e., two hours before and two hours after high tide), a period that corresponds to the methodologies undertaken for Irish Wetland Bird Survey (IWeBS) count period and covers the key wintering period. In 2015/16, two complete surveys of the count areas were carried out: one at high tide, and one on the ebb/flood tide. In winter 2015 / 2016, dusk counts were carried out at Lough Beg while additional searches for field feeding waders along the remainder of the proposed M28 Road Project corridor were carried out on three of the count days, and during each of the transect counts.

These count areas included four areas of fields (CA1 and CA4-CA6), as well as the lagoon and intertidal habitat at Lough Beg (CA2 and CA3). In 2015 / 16, an additional count area (CA7) was also defined, covering the outer part of Lough Beg and the shoreline around Lough More (see **Figure 4.1**). Inclusion of CA2, CA3 and CA7 allowed the number of birds using the fields to be compared to the numbers using the intertidal and lagoon habitats.

The findings of the field feeding surveys completed in 2014/15 and again in 2015/16 were compared with the results of bird surveys and previous surveys completed in the Lough Beg and Ringaskiddy areas including:

- Port of Cork Bird Surveys (RPS, 2012),
- Atkins - surveys of fields around the Martello Tower (including CA5, CA5* and fields to the east) carried out by Atkins on behalf of Cork County Council in 2014/15. These surveys also included some coverage of CA1 and CA4. The results cited are based on personal communications from Atkins,
- Food and Environment Research Agency (FERA) - combined radar and vantage point surveys covering the Lough Beg, Monkstown Creek and Owenboy Estuary areas, carried out by FERA in 2010/11 for the Cork Lower Harbour Wind Turbine Development project (Simms et al., 2011a, b),
- Wind Energy Project Environmental Impact Statement. SmithKline Beecham (Cork) Limited (GlaxoSmithKline) (SKB, 2011),
- Wind Energy Project Environmental Impact Statement. Novartis Ringaskiddy Limited (Novartis, 2011),
- Wind Energy Project Environmental Impact Statement. DePuy (Ireland) (Depuy, 2011),
- Wind Energy Project Environmental Impact Statement. Janssen Biologics (Ireland) (Janssen, 2011)
- Overwintering Wetland Bird Species Survey 2016 Biopark Site - Preliminary Report (Malachy Walsh & Partners, 2016),
- Counts, and vantage point watches, of the Lough Beg and Monkstown Creek area carried out by Natura Environmental Consultants in 2009/10 for the Cork Lower Harbour Wind Turbine Development project (DePuy, 2011; Janssen, 2011; Novartis, 2011; SKB, 2011), and
- Comments from the Irish Wetland Bird Survey counter for the Lough Beg I-WeBS subsite.

Incidental avifaunal records collated during site walkover surveys for other ecological disciplines were also noted.

4.2 OVER-WINTERING AVIFAUNAL SURVEYS

As outlined in **Section 4.1.1.2**, the expansive arable and pastoral fields located to the north of Lough Beg support some field feeding activity of SCI over-wintering avifaunal species associated with nearby areas of Cork Harbour SPA. The findings of over-wintering avifaunal surveys are presented in full in **Appendix B** and are summarised below.

As part of the consultation process for the proposed M28 Road Project, NPWS raised a concern about the potential for road schemes to fragment feeding habitat and deter Curlew from flying over roads to reach feeding areas. In response to this concern, over-wintering avifaunal surveys carried

out in 2014/15 by Glas Ecology included some surveys of field feeding waders in fields on the eastern side of Little Island adjacent to the N25 dual carriageway.

4.2.1 Field Survey Findings

4.2.1.1 Over-Wintering Surveys – Line Transect Surveys

In 2014 / 2015 a total of 36 no. species were recorded during the over-wintering line transect surveys completed within the study area. None of the species recorded were listed under Annex I of the EU Birds Directive. Seven species recorded during the 2014/15 line transect surveys are SCI species for Cork Harbour SPA including; Cormorant, Curlew, Grey Heron, Little Grebe, Oystercatcher, Redshank and Shelduck. With the exception of Little Grebe, all of these species were recorded within Transects 1 and 2, located between Lough Beg and Warren's crossroads (R613). With the exception of Curlew, peak numbers for these species was did not exceed 2 no. A peak number of 56 Curlew was recorded in Transect 1, which is located immediately north of Lough Beg. It is likely that these species were associated with roosting / over-wintering populations associated with Lough Beg. Little Grebe was identified within Transect 4, which parallels Raffeen Quarry. Little Grebe was also identified utilising the wetland area within Raffeen Quarry during the habitat surveys completed in 2014.

In 2015 / 2016, a total of 47 no. species were recorded in the 0-25 m and 25-100 m distance bands along the transect counts with an additional six species recorded outside these distance bands, overflying the transects, or on return walks along the transect routes. As in the 2014/15 surveys, seven SCI species for Cork Harbour SPA were identified during the line transect surveys; Shelduck, Teal, Grey Heron, Oystercatcher, Curlew, Redshank and Black-headed Gull. These were all recorded within Transects 1 and 2, located north of Lough Beg and between Lough Beg and Warren's crossroads (R613). With the exception of Curlew (12 no.) and Black-headed Gull (15 no.), maximum numbers of birds recorded did not exceed 5 no.

4.2.1.2 Over-Wintering Surveys – Field Feeding Surveys

Monthly site visits with respect to Curlew field feeding areas were undertaken during the over-wintering survey months (October-March inclusive) of 2014/2015 and 2015/2016. On each occasion, the location and number of birds feeding in fields to the north and in the environs of Lough Beg in addition to bird counts on Lough Beg were completed to ascertain the level of usage within these areas and their consequent importance to the avifaunal populations associated with nearby areas of Cork Harbour SPA, such as Lough Beg.

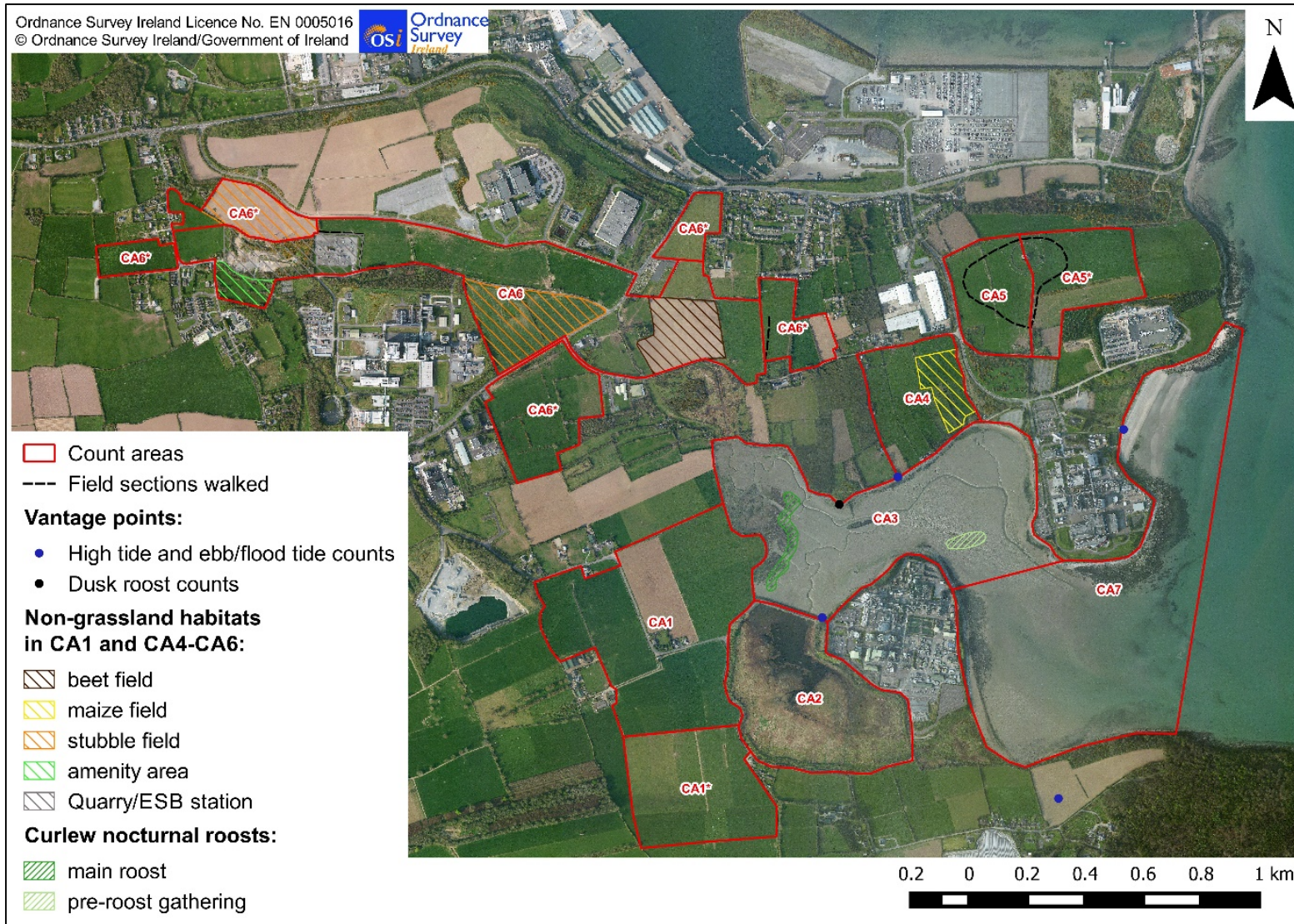


Figure 4.1: Count Areas Used for the Field Feeding Wader Survey

The findings of the over-wintering surveys completed in 2014/2015 and 2015/2016 found that the field feeding areas do not support significant numbers of regularly occurring SCI species for Cork Harbour SPA. The findings of these surveys found occasional and sporadic occurrences of small flocks of SCI species Common Gull, Black-headed Gull, Curlew and Oystercatcher within these expansive agricultural fields. The occasional occurrence of gull or Curlew flocks in these areas were attributed to opportunistic feeding following heavy rainfall periods that made prey more readily available. Studies completed across two over-wintering seasons confirmed that these grassland areas are not routinely used as a feeding habitat for the SCI species associated with Cork Harbour SPA. In addition, these studies concluded that there is, effectively, an unlimited supply of potentially suitable grassland habitat in the vicinity of Lough Beg, although there may be variations in habitat quality. Therefore, in general, it is very likely that birds displaced by loss of grassland habitat will be able to find suitable alternative habitat. The alternative habitat may not be of as high quality as the habitat that they were displaced from, but would still be likely to be capable of supporting the displaced birds.

North of Lough Beg, Curlew were noted to occur within the footprint and environs of the route sporadically and in numbers that were not of importance for Cork Harbour SPA (See **Table 4.1**). No other SCI for Cork Harbour SPA were identified in significant numbers within the footprint or the immediate environs of the proposed M28 Road Project.

Table 4.1: Numbers of Field Feeding Curlew Recorded in Areas Potentially Affected by the Proposed Route of the M28 Road Project

Over-Wintering Season	Date	Count Area (CA)	Curlew Numbers Within Route and its Environs ¹⁰
2014/15	31/10/2014	CA1	9
		CA4	-
		CA5	-
		CA6	-
	28/11/2014	CA1	56
		CA4	-
		CA5	-
		CA6	-
	22/12/2014	CA1	-
		CA4	-
		CA5	-
		CA6	-
	12/01/2015	CA1	45
		CA4	4
		CA5	42
		CA6	-
13/02/2015	CA1	4	
	CA4	7	
	CA5	-	
	CA6	-	

¹⁰ Field feeding numbers at high tide.

Over-Wintering Season	Date	Count Area (CA)	Curlew Numbers Within Route and its Environs ¹⁰
	19/03/2015	CA1	-
		CA4	-
		CA5	-
		CA6	-
2015/16	04/11/2015	CA1	43
		CA4	-
		CA5	143
		CA6	-
	20/11/2015	CA1	41
		CA4	-
		CA5	-
		CA6	-
	22/12/2015	CA1	1
		CA4	-
		CA5	-
		CA6	51
	05/01/2016	CA1	-
		CA4	-
		CA5	-
		CA6	46
	03/02/2016	CA1	79
		CA4	-
		CA5	28
		CA6	0
03/03/2016	CA1	32	
	CA4	-	
	CA5	5	
	CA6	-	

Field feeding Curlew in the Cork Harbour area feed on fields during the day and roost in estuarine areas at night. These nocturnal roosts use traditional roosting sites (often the same as high tide roosts). The Curlew that use intertidal habitat in Cork Harbour for feeding appear to show a different diel pattern of activity, feeding at low tide and roosting at high tide. While the nocturnal activity of these birds has not been directly observed, when low tide occurs around dawn or dusk, repeat counts of Curlew feeding in intertidal habitat show no evidence of birds leaving roosts at dawn, or going to roost at dusk.

In addition to Curlew, eight other waterbird species were recorded during the field feeding counts in the footprint of the proposed M28 Road Project and its environs, six of which are SCI species for Cork Harbour SPA (**Table 4.2**).

Sizeable flocks of Black-headed Gull and Common Gull occurred regularly, mainly in fields to the west of Lough Beg or in pastoral fields in the Barnahely and Castlewarren areas. Unlike other SCI species for Cork Harbour SPA, gulls are not restricted to intertidal habitats but use a range of coastal, pastoral and peri-urban habitats within and fringing Cork Harbour. The numbers of Black-headed Gull and Common Gull wintering in Cork Harbour SPA and its surrounding hinterland are estimated to be in the range of 20,000-50,000 no. birds, respectively, based on sample nocturnal roost counts (Tom Gittings, pers. comm.). This compares to mean annual peaks from IWeBS counts of 3,385 no. and 314 no. respectively, showing that the majority of these gulls do not feed in Cork Harbour. The designation of Black-headed Gull as a SCI species for Cork Harbour SPA is informed by the findings of the Irish Wetland Bird Survey (IWeBS), which does not account for numbers of birds associated with nocturnal roost sites. In addition, Black-headed Gull numbers identified north of Lough Beg are relatively fractional, when represented as a percentage of the total numbers of birds roosting at Cork Harbour area and its surrounding hinterland.

There were occasional records of other gull species (Mediterranean Gull and Lesser Black-backed Gull) associated with these flocks. During dusk watches at Lough Beg, large numbers of Black-headed Gull and Common Gull were recorded flying south into Lough Beg, where they would settle on intertidal habitat, or in subtidal water, at the mouth of the lough before flying on to roost in open waters between Fort Camden and Spike Island.

Small numbers of Little Egret and Snipe also occurred regularly. The Little Egret mainly occurred in pastoral fields around Castlewarren. Snipe were only recorded from pastoral fields located to the south of Ringaskiddy in the vicinity of the Martello Tower, but this was because Snipe were only detected when they were flushed and this was the only area where extensive areas of fields were walked. Oystercatcher and Black-tailed Godwit (which regularly feed on fields in other areas around Cork Harbour) was only recorded field feeding occasionally and in small numbers in this survey. The Oystercatcher flock on 04/11/2015 was recorded in the fields to the east of the Martello Tower south of Ringaskiddy, while the Black-tailed Godwit flock on 03/02/2016 was recorded immediately west of Lough Beg upon extensive areas of pastoral land.

Table 4.2: Numbers of Field Feeding Waterbirds (excluding Curlew) Recorded during High Tide (HT) and Ebb/Flood Tide (E/F) Counts during the Field Feeding Survey, 2015/16

Species ¹¹	04/11/2015		20/11/2015		22/12/2015		05/01/2016		03/02/2016		03/03/2016	
	HT	E/F	HT	E/F	HT	E/F	HT	E/F	HT	E/F	HT	E/F
Little Egret*	0	0	1	1	8	1	0	3	2	1	0	0
Oystercatcher*	34	0	3	0	0	0	0	0	0	0	0	0
Snipe	2	2	0	0	0	2	0	3	2	2	2	0
Black-tailed Godwit*	1	0	0	0	0	0	0	0	26	0	0	0
Black-Headed Gull*	0	26	14	48	75	0	0	99	26	83	17	16
Common Gull*	0	3	32	48	131	0	0	163	43	118	0	97
Mediterranean Gull	0	0	0	0	1	0	1	0	1	0	0	1
Lesser Black-Backed Gull*	0	0	0	1	0	0	0	0	0	0	0	0

A combination of desktop assessments reviewing previous surveys undertaken (see **Section 4.1.1.2**) and field surveys completed between 2014 and 2016 confirmed that the footprint of the proposed M28 Road Project does not support regular occurrences of field feeding wintering waterbirds at numbers that meet international or national importance thresholds or numbers of importance to Cork Harbour SPA. As evidenced by the findings of the field feeding surveys completed in 2014/15 and 2015/16 (See **Table 4.1**), field feeding patterns for Curlew in pastoral lands to the north of Lough Beg is opportunistic and intermittent and is likely to be influenced by periods of heavy or prolonged rainfall, where prey may be more readily available.

4.2.1.3 Fragmentation of Field Feeding Areas

As part of the consultation process for the proposed M28 Road Project, NPWS raised a concern about the potential for road schemes to fragment feeding habitat and deter Curlew from flying over roads to reach feeding areas. In response to this concern, over-wintering avifaunal surveys carried out in 2014/15 by Glas Ecology included some surveys of field feeding waders in fields on the eastern side of Little Island adjacent to the N25 dual carriageway.

This assessment was conducted to undertake a comparative analysis determining ongoing fragmentation impacts associated with the N25 road scheme where it bisects the northern sections of the Glounthaune Estuary / Slatty Water. It is thought that the determination of impacts in this area could be extrapolated to determine potential impacts associated with the proposed M28 Road Project in those areas north of Lough Beg.

The field studies completed in 2014/15 were inconclusive as the numbers of birds using the fields on the eastern side of Little Island were relatively low. However, it was recorded that wading birds, including Curlew, Oystercatcher, Lapwing, Redshank and Black-tailed Godwits use fields immediately adjacent to the N25 road flying over the road to access mudflats and roosting areas to the north of the road.

¹¹ *SCI species for Cork Harbour SPA

Dr. Tom Gittings has counted the Glounthaune Estuary / Slatty Water area for the Irish Wetland Bird Survey (I-WeBS) since 1995, and has also carried out many other non-I-WeBS counts of this area. Dr. Gittings routinely records numbers of waders feeding in several areas of fields adjacent to the estuary and has collated a long-term dataset on patterns of field feeding behaviour in this area of Cork Harbour. When undertaking the over-wintering avifaunal survey report for 2015/16, Dr. Gittings used this dataset to analyse the usage of different areas around the Glounthaune Estuary / Slatty Water by Curlew. Analysis of this dataset and the interaction of Curlew activity in the Glounthaune Estuary / Slatty Water are presented in greater detail below.

4.2.1.3.1 Count Sectors

The counts of Glounthaune Estuary/Slatty Water in the dataset are divided into 19 sectors. These sectors subdivide the overall subsite. Six of these sectors represent areas of fields that are used by field feeding waders (see **Table 4.3** and **Figure 4.2**). Each of these sectors comprises a block of fields lacking significant internal divisions. All six sectors mainly comprised intensively managed improved grassland. However, there have been land management changes in two of these sectors (HN and LIWF) in recent years, while a section of LIEF was under arable crops in the early/mid-2000s (see **Table 4.3**). Three sectors are immediately adjacent to the N25 dual carriageway (HN, LIEF and LIWF), while the other three (SF, SP and WIF) are around 0.5-1.5 km from the dual carriageway (but SP is adjacent to the busy R624 road) (see **Figure 4.2**). A nocturnal Curlew roost occurs in Slatty Water. This roost uses a saltmarsh island to the north of the dual carriageway at high tide, and an area of mudflat to the south of the dual carriageway at high tide (see **Figure 4.2**).

Table 4.3: Sectors of the Glounthaune Estuary/ Slatty Water with Field Feeding Habitat

Code	Sector	Area (ha) of grassland	Description
HN	Harper's North	11.8 (8.9 after 2006)	Low-lying fields on the northern side of Harper's Island. These fields were improved grassland grazed by sheep until the summer of 2006. Since then, the fields have not been managed intensively and now regularly flood in winter. Part of the fields (HN1) has now developed into <i>Salicornia</i> -dominated saltmarsh, while the remainder (HN2) are rough grassland grazed by horses. Since 2006, counts may include birds feeding or roosting in the <i>Salicornia</i> zone, but these birds are counted separately from the birds feeding in the remaining fields and have not been included in the dataset analysed in this report.
LIEF	Little Island East fields	19.7 (11.8 in the early/mid-2000s)	Large fields of improved grassland on the eastern side of Little Island. These are mainly on sloping ground, but include a small section of low-lying fields, which can flood, around a small tidal inlet. A section of the fields were under arable crops for several years in the early/mid-2000s.
LIWF	Little Island West fields	16.5	Two low-lying fields on the northern side of Little Island, adjacent to the western end of the Glounthaune Estuary. These fields were intensively managed as improved grassland but appear to have been somewhat neglected in recent winters. However, these fields have not been routinely counted since the winter of 2005/06, due to the growth of vegetation along the N25 (which have obscured the fields from the vantage points previously used).
SF	Slatty fields	13.7	Low-lying fields of improved grassland to the south-east of

Code	Sector	Area (ha) of grassland	Description
			Slatty Pool. Parts of these fields occasionally flood.
SP	Slatty Pool	9.1	Slatty Pool is a lagoon formed by the impoundment of the upper end of Slatty Water. The Slatty Pool count sector includes the lagoon and fields of improved grassland to the south of the pool. These fields include low-lying sections along the edge of the pool, which can flood, and areas of higher ground to the south. Counts from this sector may include birds roosting along the edge of the pool, but these birds are counted separately from the birds feeding in the fields and have not been included in the dataset analysed in this report.
WIF	Weir Island fields	22.2	Fields of improved grassland between the inlet at Rossmore and the fields to the north. These fields have been used for licensed waste deposition, which has raised the level of the fields. However, the majority of the sector has remained as improved grassland throughout the period covered by this analysis.

See **Figure 4.2** for sector boundaries and other details.

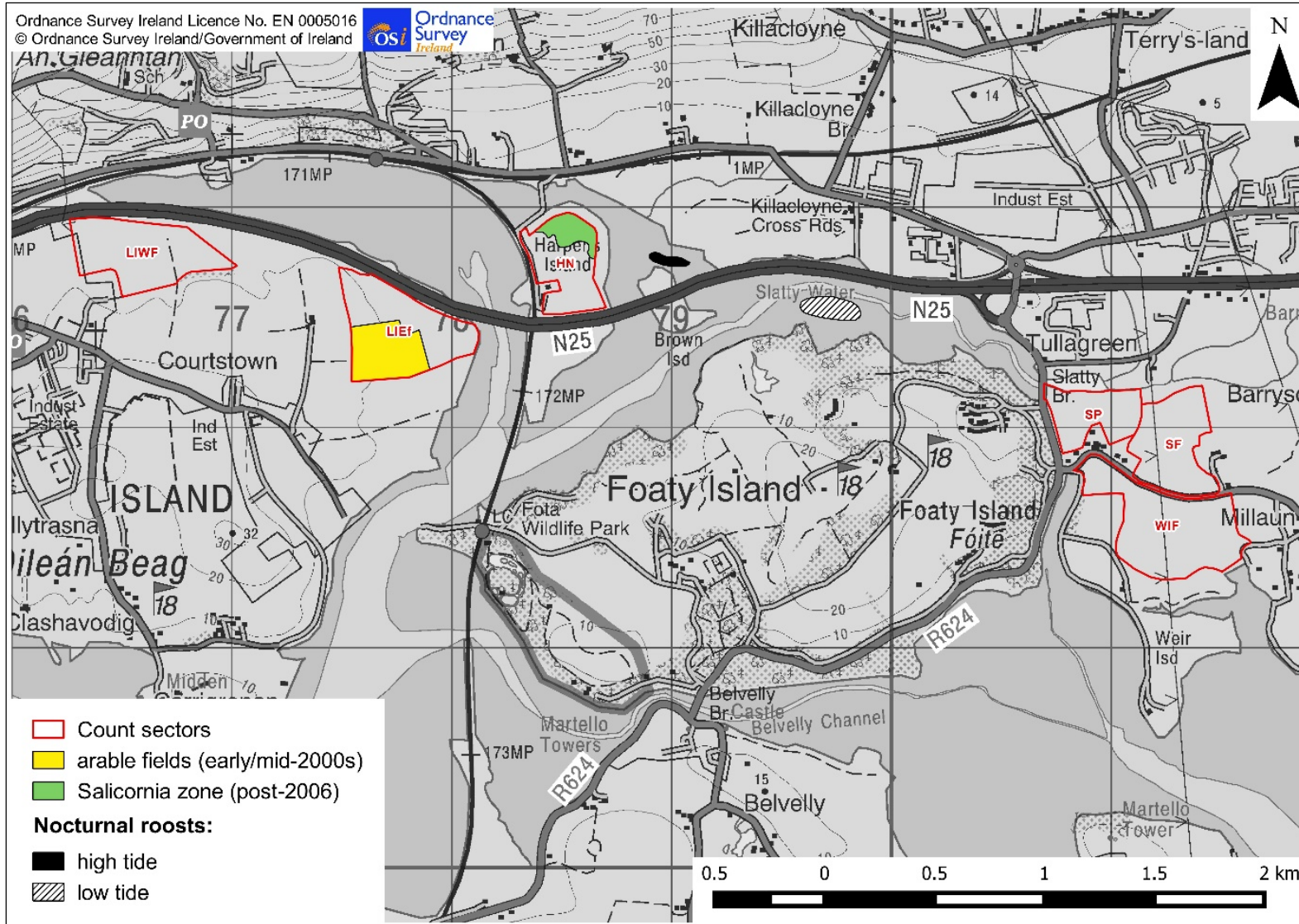


Figure 4.2 Glounthaune Estuary/Slatty Water Count Sectors Included in the Analyses of Field Feeding Curlew

4.2.1.3.2 Data Analysis and Results

This analysis utilises IWeBS count data from the winters (September-March) of 2001/02-2015/16. A total of 91 counts were included in this dataset, and field feeding Curlew were recorded on 76 of these counts.

Field feeding Curlew showed a strongly seasonal pattern of occurrence: during the November-February period, they occurred on 86% of the counts, with a median number per count of 12-16 no. birds, while in September-October and March they only occurred on 53% of the counts with a median number per count of 0-1 birds. **Table 4.4** presents a summary of seasonal pattern of occurrence of field feeding Curlew around Glounthaune Estuary / Slatty Water, 2001/02 – 2015/16.

Table 4.4: Summary of Seasonal Pattern of Occurrence of Field Feeding Curlew around Glounthaune Estuary / Slatty Water, 2001/02 – 2015/16

Month	Number of Counts	Field Feeding Curlew Numbers		
		Median Count	Maximum Count	% Non-Zero Counts
September	13	1	12	54%
October	13	1	22	69%
November	12	12	53	92%
December	14	8	92	71%
January	16	14	157	88%
February	15	14	111	93%
March	8	0	8	25%

The occurrence of field feeding Curlew in individual count sectors was analysed across two periods: 2001/02-2005/06 and 2006/07-2015/16. During 2001/02-2005/06, the LIWF sector was counted, and the HN sector was intensively grazed by sheep and was not subject to tidal flooding. Also, for some, or all, of this period part of the LIEF sector was under arable crops. From 2006/07, the LIWF sector was not counted, intensive grazing of the HN sector ceased and it was subject to tidal flooding, and the entire LIEF sector was under improved grassland.

Compared to the pattern of field feeding in the Lough Beg area, there does not appear to be a single strongly preferred area for field feeding in the Glounthaune Estuary/Slatty Water area (see **Table 4.5**). During 2001/02-2005/06, the HN, LIWF and WIF sectors were the most frequently used by field feeding Curlew, and supported the largest numbers. The mean count for the SF sector was also high, but this was due to a single large count of 77 birds. From 2006/07, the frequency of usage of the HN sector decreased (from 62% to 26% of the counts), possibly reflecting the changes in management which reduced the area of grassland, and produced a rougher sward. The frequency of usage of the LIEF sector increased (from 23% to 37% of the counts), possibly reflecting the increased area of improved grassland. The frequency of usage of the WIF sector was similar between the two periods.

Table 4.5: Summary of Curlew Field Feeding Records in Glounthaune Estuary / Slatty Water, 2001/02 – 2005/06 and 2006/07-2015/16

Sector	Area (ha)	2001/02-2005/06 (n= 26 counts)			2006/07-2015/16 (n = 46 counts)		
		Number of Records		Mean Count	Number of Records		Mean Count
		All Flocks	>9 Birds		All Flocks	>9 Birds	
		16	5	12	12	3	12
HN	11.8/8.9						
LIEF	11.8/19.7	6	2	8	17	13	26
LIWF	16.5	11	7	17	-	-	-
SF	13.7	5	2	22	6	1	5
SP	9.1	3	1	7	12	4	10
WIF	22.2	10	6	25	15	10	27

The mean count is the mean across counts where Curlew occurred (i.e., it excludes zero values).

In **Table 4.6**, the sectors are grouped by whether they are close to, or distant from, the N25 dual carriageway. During 2001/02-2005/06, the areas of the close and distant sector groups were very similar. During this period, field feeding Curlew occurred more frequently in the close sectors, but, when they did occur in the distant sectors numbers tended to be higher. The area of the close sector groups was lower in the 2006/07-2015/16 period due to the cessation of counting of the LIWF sector. However, both the frequency of occurrence, and the numbers occurring were very similar between the two sector groups during this period.

Table 4.6: Comparison of the Occurrence of Field Feeding Curlew in Fields Close to (near), and Distant from (far), the N25 Dual Carriageway

	Distance from N25	Area (ha)	Number of Records		Mean Count
			All Flocks	>9 Birds	
2001/02-2005/06 (n= 26 counts)	close	40	24	12	17
	distant	45	13	8	30
2006/07-2015/16 (n = 46 counts)	close	29	28	15	20
	distant	45	29	15	19

The close group includes sectors HN, LIEF and (2001/02-2005/06 only) LIWF. The distant group includes sectors SF, SP and WIF. The area for the close group in 2001/02-2005/06 excludes the area of the arable fields in LIEF, while the area for the close group in 2006/07-2015/16 takes account of the reduction in area of field habitat in HN.

5 IMPACT ASSESSMENT

Impacts can be direct and indirect and the impacts that could potentially occur through the implementation of the proposed M28 Road Project are as follows:

- Disturbance to key SCI species;
- Loss and fragmentation of field feeding habitat;
- Reduction in species density; and
- Changes in key indicators of conservation value such as decrease in water quality and quantity.

5.1 DIRECT IMPACTS

The proposed M28 Road Project is not located within lands designated for nature conservation, including Cork Harbour SPA and Great Island Channel SAC. Consequently, none of the lands designated as part of these European sites will be directly impacted or removed as a result of the proposed M28 Road Project. Therefore, there will be no direct impacts to European sites in this regard.

5.2 INDIRECT IMPACTS

The proposed M28 Road Project is connected to Cork Harbour SPA via three watercourses draining the study area, i.e., the Woodbrook, Donnybrook and the Glounatouig streams. The road project will also support connectivity to Cork Harbour SPA via three marine outfalls. The area between Shannonpark and Ringaskiddy support higher permeability in the underlying bedrock, when compared with the remainder of the scheme. Due to this increased permeability, there is a greater degree of potential interconnectivity between ground and surface water in this area with groundwater being discharged to springs and to receiving watercourses such as the Glounatouig stream. By extension, the waters of Cork Harbour provide indirect, but remote, connectivity to the nearest sections of the Great Island Channel SAC, 5.1km east. Therefore, the proposed development may, in the absence of best practice and mitigation measures, impact indirectly on Cork Harbour SPA and by extension Great Island Channel SAC through indirect connectivity maintained by watercourses draining the site.

Construction and operation of the proposed road project may also result in intermittent, localised disturbance of areas located north of the Lough Beg section of Cork Harbour SPA. Construction activities associated with the proposed M28 Road Project may result in temporary and localised disturbance effects and avifaunal avoidance of this area. The Douglas River estuary section is located in proximity to the existing N28 and the proposed works in this area (construction and operation) will not lead to the disturbance of avifaunal activities, direct or indirect, for this section of Cork Harbour SPA.

5.2.1 Great Island Channel SAC

Indirect impacts to Great Island Channel SAC include potential run-off of construction and operational phase pollutants into the receiving watercourses draining the scheme; i.e., Woodbrook Stream, Glounatouig Stream and the Donnybrook Stream. These watercourses drain to and support connectivity with Cork Harbour which in turn provides a tenuous link to Great Island Channel SAC.

Indirect impacts to this European site as a result of deterioration in water quality to Cork Harbour may impact upon the Annex I coastal habitats for which this European site is designated (see **Table 3.3**).

5.2.2 Cork Harbour SPA

Indirect impacts to Cork Harbour SPA include construction and operational phase run-off into nearby areas of Cork Harbour SPA, via watercourses draining the study area or through the construction in proximity to the SPA, such as those areas near the Douglas River Estuary. Both the Woodbrook and Donnybrook Streams drain toward the Douglas River Estuary which is designated as part of Cork Harbour SPA. In addition, the Glounatouig Stream drains into Monkstown Creek which is also designated as part of Cork Harbour SPA (see **Figure 3.2**). In the absence of best practice design and standardised mitigation in relation to surface water attenuation and regulation, it is possible that run-off from the proposed M28 Road Project could result in deleterious substances such as suspended solids, particulate matter and hydrocarbons entering receiving watercourses and waterbodies draining the proposed road. Reductions in water quality of those watercourses draining the road could result in knock-on effects to receiving waterbodies that include Monkstown Creek and Douglas Estuary, both of which are designated as part of Cork Harbour SPA.

Construction activities may result in temporary and infrequent disturbance of avifauna associated with nearby areas of Cork Harbour SPA, namely the Lough Beg area that intermittently use the footprint and environs of the proposed M28 Road Project. Such disturbance events can result from the increased noise and human activity levels associated with heavy machinery and the construction works. These disturbance events will be localised and intermittent and are not significant in terms of species populations associated with Cork Harbour SPA. Construction activities along the northern extents of the scheme are located in proximity to the Douglas River Estuary section of Cork Harbour SPA. Construction activities in this area will be situated within the footprint of the existing N28 and the immediate adjoining verge area, both of which are located outside of the footprint for Cork Harbour SPA. Works in this area will also involve the construction of an outfall to the north of the project footprint within an area of embanked land.

Potential indirect impacts associated with the Lough Beg section of Cork Harbour SPA were informed through desktop assessment of the study area and its surrounds in addition to the findings of the over-wintering avifaunal surveys for 2014/15 and 2015/16 (refer to **Appendix B**). These are described in greater detail below.

5.2.2.1 Habitat Loss

The proposed route of the M28 Road Project will cause direct removal of grassland habitat in the Barnahely townland/Castlewarren areas, which is used intermittently and by low numbers of over-wintering Curlew, which are SCI species for Cork Harbour SPA.

When compared to loss of grassland/pastoral habitats, loss of intertidal habitat is generally considered to be a potentially significant impact because intertidal habitat is a limited resource and grassland/pastoral habitats are abundant in the wider area as birds displaced from intertidal areas may not be able to find any alternative habitat that is not already at its effective carrying capacity. If this is the case, the displaced birds will have to compete with birds elsewhere in the site for food, and density-dependent reductions in survivorship and/or body condition may occur. Density-dependent reductions in survivorship mean that survival rates decrease as population density

increases. Loss of body condition in overwintering bird populations may result in reduced survivorship on spring migration to breeding grounds that in turn may result in failed breeding attempts. There will be no direct loss of intertidal habitat as a result of the proposed M28 Road Project.

Loss of grassland habitats used by field feeding waders present a different scenario. There is, effectively in the environs of Lough Beg, an unlimited supply of potentially suitable habitat, although there may be variations in habitat quality. Therefore, in general, it is very likely that birds displaced by loss of grassland habitat will be able to find suitable alternative habitat. The alternative habitat may not be of as high quality as the habitat that they were displaced from, but would still be likely to be capable of supporting the displaced birds.

There may be exceptions to the above, where an area of fields has features that make it particularly suitable for field feeding birds; e.g. soil depth, soil moisture, prey availability, sightlines etc. However, the low level usage of those fields located to the north of Lough Beg indicate that it has no such features to encourage routine and sustained feeding activity during the over-wintering period. Therefore, the loss of suitable field feeding habitat or disturbance events resulting in the intermittent abandonment of suitable habitat north of Lough Beg will be offset through the availability of similar sections of pastoral habitat in the greater locality, and in the environs of the Lough Beg area. These include pastoral lands located immediately west and south-west of Lough Beg and lands to the south of Ringaskiddy (east of the Martello Tower) (see **Figure 4.1**).

There will be no habitat loss in the other proximal areas of Cork Harbour SPA as a result of the proposed works; i.e. Monkstown Creek and Douglas River Estuary.

5.2.2.2 Disturbance / Habitat Fragmentation

Between Lough Beg and Ringaskiddy, the proposed route of the M28 Road Project will intersect pastoral habitats that are intermittently utilised by small numbers of Curlew as field feeding areas. Curlew is an SCI species of the Cork Harbour SPA. The construction of the M28 Road Project in this area may result in a barrier effect preventing Curlew from utilising pastoral habitats in this area. Barrier effects associated with the road may deter species such as Curlew from overflying (or flying nearby) live roads to reach potential feeding habitats. In addition, disturbance events associated with major roads may result in the avoidance, or reduced utilisation, of suitable habitats adjacent to the roads.

Construction activities associated with the proposed M28 Road Project may result in temporary and localised disturbance effects and avifaunal avoidance of the construction area. However, it is expected that these disturbance events will be localised and intermittent. Field feeding areas will continue to be used intermittently by avifauna during the operational phase at opportune times of the over-wintering season; e.g. periods of concurrent high tide and prolonged periods of rainfall.

In addition, there is evidence of continued Curlew usage in other intertidal sections of Cork Harbour in areas adjacent to major roads e.g. the Douglas Estuary, Lough Mahon, Dunkettle, and the Glounthaune Estuary/Slatty Water. Continued usage of these areas suggests that disturbance and fragmentation impacts from road development do not cause complete avoidance of affected areas. The effects of the operational phase of the proposed M28 Road Project, particularly in relation to the fragmentation of field feeding area surrounding sections of Cork Harbour SPA, are considered in greater detail in **Section 5.1.2.6** below.

5.2.2.3 Displacement Impacts

Displacement impacts to waterbirds are usually quantified as percentages of the overall size of the relevant population. For Cork Harbour, the Curlew population is monitored by counts carried out by the Irish Wetland Bird Survey (I-WeBS). The Curlew counts for the most recent four winters available for Cork Harbour SPA are shown in **Table 5.1**. The peak counts occur in September/October, with lower numbers in mid-winter. However, the coverage of field feeding birds by the I-WeBS counts is limited. Field feeding Curlew may be counted where they occur in fields adjacent to I-WeBS subsites, but many will be missed. Therefore, it is not clear whether the autumn peak is due to passage birds on migration, field feeding birds being missed during mid-winter, or a combination of these factors.

Table 5.1: Curlew Count Totals from Irish Wetland Bird Survey (I-WeBS) Counts of Cork Harbour

Season	September	October	November	December	January	February	March
2011/12	1662	978	887	623	1357	1197	324
2012/13	1234	1193	506	-	628	1266	-
2013/14	1163	-	747	846	883	855	527
2014/15	1987	1307	-	662	797	851	-
2015/16	1326	988	-	1134	705	1684	253

The mean November-February Cork Harbour Curlew count is 893 no. A major nocturnal Curlew roost occurs in Slatty Water, where an additional 100 – 800 no. birds can occur, compared to the numbers counted in the Glounthaune Estuary/Slatty Water subsite during the day (Tom Gittings, pers. comm.). As well as the Slatty Water and Lough Beg roosts, nocturnal Curlew roosts occur at Rossleague, Rathcoursey and Saleen Creek, and there may be additional roosts elsewhere. An estimate of the typical mid-winter Cork Harbour Curlew population may be in the range 1500-2500 no. birds. This would mean that there is potential for intermittent displacement of small numbers of curlew due to the proposed M28 Road Project during the scheme's operational phase. The displacement of small numbers of Curlew north of Lough Beg are associated with improved grassland, a habitat that is widely distributed within the environs of the Lough Beg area. Displaced species such as Curlew will be able to relocate to proximal improved grassland habitats that offer similar field feeding opportunities, such as prey abundance, sightlines etc. As a result, the displacement of intermittently occurring Curlew within these fields is not considered significant in terms of the over-wintering population associated with Cork Harbour SPA.

5.2.2.3.1 Fragmentation of Field Feeding Areas

The analysis of Dr Gittings' dataset on field feeding Curlew in the Glounthaune Estuary/Slatty Water subsite shows that Curlew routinely feed on fields immediately adjacent to the existing N25 dual carriageway, and found no evidence that fields further from the dual carriageway were preferred by Curlew and that fragmentation of estuarine habitats in this area by the N25 road scheme reduced the feeding occurrence of over-wintering avifauna. Based on the findings of Dr. Gittings' dataset, it is considered that Curlew intermittently utilising pastoral lands to the north of Lough Beg will continue to use these areas intermittently, if the proposed M28 Road Project is constructed, as and when suitable feeding conditions occur.

There are, however, some limitations to the conclusions that can be drawn from this analysis. There are various additional factors that may affect Curlew usage of fields, which could, in theory, obscure any relationship that may exist between field usage and proximity to the dual carriageway. These additional factors may include the pasture quality, soil type, drainage, proximity to the nocturnal roost, and other disturbance sources. Furthermore, counts of the Slatty Water nocturnal roost indicate that the field areas included in the analysis only support a small proportion of the total field feeding Curlew population in the area. However, notwithstanding these limitations, the analysis does indicate that any disturbance/fragmentation impacts from the proposed M28 Road Project will be of limited magnitude and not significant.

5.2.2.4 Potential Noise Disturbance to nearby sections of Cork Harbour

Lough Beg is located ca. 400 m south of the proposed M28 Road Project in the Ringaskiddy area. Modelling of anticipated noise levels associated with the proposed M28 Road Project has been completed as part of the accompanying EIS (**Chapter 14 Noise and Vibration**). Based on the findings of the model, predicted noise levels from the proposed M28 on the most proximal intertidal areas of Lough Beg are not expected to exceed 50 decibels (dB). Lough Beg is also adjoined by the Havione and Glaxo-Smith Kline pharmaceutical plants to the east and south respectively. The operations associated with these plants cannot exceed 55 db. The over-wintering avifaunal population roosting and feeding within Lough Beg have become habituated to noise levels associated with the nearby manufacturing facilities. Noise levels from the proposed M28 Road Project will not contribute to cumulative or in-combination noise related impacts that could result in disturbance events to avifaunal species utilising Lough Beg as an over-wintering habitat (See **Chapter 14** of the EIS prepared for this project).

In addition, birds using Lough Beg as an over-wintering habitat will become habituated to continual traffic noise associated with the proposed M28 Road Project. Noise levels associated with the proposed M28 Road Project are anticipated to be steady and maintained at certain thresholds levels such that they would not contribute towards infrequent or intermittent disturbance or displacement of avifauna from Lough Beg.

The northernmost section of the road lies in proximity to the Douglas River Estuary Section of Cork Harbour SPA. Proposed works in proximity to this area are primarily located within the curtilage of the existing N28, in addition to works associated with the construction of Outfall No 1. Noise levels associated with the construction and operation of the proposed road scheme will not exceed current levels associated with the existing N28 road. Therefore there will be no disturbance related impacts to SCI species associated with the Douglas River Estuary section of Cork Harbour SPA.

5.2.2.5 Potential Noise Disturbance to Adjoining Field Feeding Areas

Avifauna utilising pastoral areas adjoining or within the immediate footprint of the proposed M28 Road Project may be displaced or may avoid suitable field feeding habitat in the scheme's immediate vicinity or environs, during the project's construction and operational phases. The findings of the avifaunal surveys completed in the over-wintering seasons of 2014/15 and 2015/16 confirmed that expansive pastoral fields within the footprint and environs of the scheme north of Lough Beg support occasional occurrences of over-wintering avifauna to include Curlew and Gulls. However, the numbers of avifauna within this area do not occur in significant numbers for Cork Harbour SPA and do not provide essential feeding or roosting grounds associated with this European site. Furthermore, the over-wintering avifaunal surveys established that these areas are utilised

intermittently, often when these fields provide suitable foraging conditions such as periods following heavy and prolonged rainfall. It is highly likely avifauna will habituate to traffic regimes, similar to behaviour of avifauna adjoining the N25, associated with the proposed M28 Road Project and continue to use the areas in the vicinity of the proposed M28 Road Project intermittently.

5.2.2.6 Air Pollution

The principal pollutants of concern which originate from road developments are the nitrogen oxides (NO_x), in terms of impact on sensitive ecosystems. Nitrogen oxides (NO_x) may have a positive or negative impact by acting as a fertiliser or a phytotoxicant. Effects are mainly on vegetation growth, photosynthesis, and nitrogen assimilation/metabolism.

The alignments of the existing N28 and the proposed M28 Road Project are close to the Cork Harbour SPA in a number of locations as follows:-

- Bloomfield Interchange;
- Monkstown Creek; and
- Ringaskiddy Village and Lough Beg.

The results of the local monitoring undertaken in the Cork area indicates that levels of NO_x of the order of 43µg/m³ which is above the annual NO_x limit for the protection of vegetation of 30µg/m³ (Table 5.2). Given the ecological sensitivity of the area, a nitrogen deposition assessment has been carried out as per the NRA Guidelines.

Using the results of the dispersion modelling and the procedures outlined in the NRA Guidelines, an assessment of nitrogen deposition on these sensitive ecosystems has been undertaken. Table 5.2 presents the results in terms of nitrogen deposition on the wetland at Cork Harbour SPA as a result of traffic associated with the proposed M28 road development in 2020.

Table 5.2: Predictions of Nitrogen Deposition at Sensitive Ecosystems in 2020

Ecosystem	2020 Do-Minimum NO ₂ Concentration (µg/m ³)	2020 Do-Something NO ₂ Concentration (µg/m ³)	Nitrogen Deposition with proposed M28 kg(N)/ha/year
Cork Harbour SPA	17.73	17.46	1.75
United Nations Economic Commission for Europe (UNECE) Critical Load (kg(N)/ha/year) – Moist to Wet Dune Slacks			10-25
UNECE Critical Load (kg(N)/ha/year) – Pioneer and low-mid salt marshes			30-40

The predicted nitrogen deposition levels onto the Cork Harbour SPA site as a result of the proposed M28 Road Project indicate levels of approximately 1.75 kg (N)/ha/year and shows a slight decrease from the predicted deposition levels from the existing N28 alignment. The slight reduction is as a result of the main traffic being moved further south and away from the SPA.

The deposition with the M28 Road Project in operation (1.75 kg(N)/ha/year) is compared to the UNECE (United Nations Economic Commission for Europe) critical loads for nitrogen as presented in

the NRA *Guidelines for the Treatment of Air Quality during the Planning and Construction of National Road Schemes* (NRA, 2011). The UNECE critical load for nitrogen in moist to wet dune slacks is 10-25 kg(N)/ha/year. These results indicate that the levels of nitrogen deposition are less than 20% of the critical load as set by UNECE with the proposed M28 Road Project in operation.

In addition, it should be noted that the future ‘Do-Minimum’ scenario in 2020 indicates that a higher level of nitrogen deposition will occur on Cork Harbour SPA if the proposed M28 Road Project was not in operation. This low level of nitrogen deposition also applies to the other sensitive habitats that are adjacent to the route but are not within the Natura 2000 network.

Other than nitrogen oxides (NO_x), the other potential impact on sensitive ecosystems will be the potential impact of construction dusts during the construction phase. Dusts can be deposited on the leaves of plants reducing the photosynthetic potential. The Design Manual for Roads and Bridges (DMRB) guidance states that dust or particles falling onto plants can physically smother the leaves affecting photosynthesis, respiration and transpiration. The literature suggests that the most sensitive species appear to be affected by dust deposition at levels above 1000 mg/m²/day. As such, once dust deposition rates are maintained within the standard guideline for human nuisance (350mg/m²/day) construction dust will not impact upon on sensitive ecosystems such as Cork Harbour SPA and its SCIs.

5.3 ASSESSMENT OF HABITATS AND SPECIES OF CONSERVATION INTEREST

The site specific Conservation Objectives for Cork Harbour SPA are presented in **Section 3.1.2.2**. This section assesses the likelihood of the proposed M28 Road Project impacting the site specific conservation objectives and SCIs assigned for Cork Harbour SPA.

5.3.1 Attributes for Over-wintering Populations of Cork Harbour SPA

Potential impacts to the attributes and associated targets for all over-wintering SCI species of Cork Harbour SPA are presented in **Table 5.3** below.

Table 5.3: Site-Specific Conservation Objectives, Attributes and Targets for Over-wintering Bird Populations of Cork Harbour SPA (NPWS, 2014a)

Over-Wintering Bird Populations for Cork Harbour SPA			
Conservation Objective: To maintain the favourable conservation condition of the following over-wintering species in Cork Harbour SPA (Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Black-headed Gull, Common Gull, Lesser Black-backed Gull) which is defined by the following list of attributes and targets:			
Attribute	Measure	Target	Impact Assessment
Population Trend	Percentage Change	Long term population trend stable or increasing	The site specific target for this attribute is to maintain the long term population trend for over-wintering SCI species for Cork Harbour SPA as stable or increasing. The findings of the desk and field based surveys completed to inform this NIS and the accompanying EIS, confirm that the footprint of the proposed M28 Road Project and its immediate environs are not located upon integral or routinely utilised over-

Over-Wintering Bird Populations for Cork Harbour SPA			
			wintering, roosting or feeding habitats critical for over-wintering populations of SCI species. The proposed M28 Road Project will not result in direct or indirect impacts to nearby areas of Cork Harbour SPA or the SCI species for which this SPA is designated such as disturbance of avifaunal feeding habits and regimes, roosting, inter-sit commuting and noise disturbance effects. Therefore there will be no impacts or changes in population trend to Cork Harbour SPA.
Distribution	Range, timing and intensity of use of areas	No significant decrease in the range, timing or intensity of use of areas by these species other than that occurring from natural patterns of variation	The site specific target for this attribute is for no significant decrease in the range, timing or intensity of use by avifaunal species other than that occurring from natural patterns of variation. To this end, over-wintering avifaunal surveys completed in 2014/15 and again in 2015/16 have confirmed that the footprint and the immediate environs of the proposed route do not support or provide suitable habitat to support the distribution of SCI species for which this European site has been designated. These surveys confirmed that some fields along the footprint of the route support intermittent and opportunistic occurrences of Curlew, an SCI species, north of Lough Beg. However, over-wintering avifaunal surveys confirmed that over-wintering avifauna utilising these fields occur sporadically and in numbers that were not of importance for Cork Harbour SPA.
Conservation Objective: To maintain the favourable conservation condition of the wetland habitat in Cork Harbour SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:			
Attribute	Measure	Target	Notes
Wetland Habitat Area	Hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 2,587 hectares, other than that occurring from natural patterns of variation	The site specific target for this attribute is for the permanent area occupied by the wetland habitat to be stable and not significantly less than the area of 2,587 hectares, other than that occurring from natural patterns of variation. The proposed M28 Road Project development will not result in the direct land-take or indirect habitat degradation of the wetland habitats comprising Cork Harbour SPA. Therefore, the proposed development will not impact this attribute for Cork Harbour SPA in this regard. Indirect impacts to wetland habitats associated with Cork Harbour SPA will be avoided through the implementation of best practice construction measures and scheme drainage design.

5.3.1.1 Attributes for Breeding Populations of Cork Harbour SPA

Cork Harbour SPA supports one SCI breeding species; i.e. Common Tern (*Sterna hirundo*). Attributes and proposed targets to maintain favourable conservation condition for this species in addition to potential impacts are presented in **Table 5.4** below.

Table 5.4: Conservation Objectives for Common Tern Population within Cork Harbour SPA¹²

A193 Common Tern (<i>Sterna hirundo</i>)			
To maintain the favourable conservation condition of Common Tern in Cork Harbour SPA, which is defined by the following list of attributes and targets:			
Attribute	Measure	Target	Potential Impact
Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline	The proposed M28 Road Project is not located within or in proximity to breeding sites for Common Tern within Cork Harbour SPA.
Productivity rate: fledged young per Breeding pair	Mean number	No significant decline	The mooring dolphins at Ringaskiddy deep water port support breeding populations of Common Tern. In 2012, between 45 and 50 pairs of Common Tern bred successfully at the mooring dolphins within Ringaskiddy deep water port (RPS, 2014). Between 2002 and 2015, a small colony of Common Tern attempted to breed on an island in a lagoon on the south west corner of Monkstown Creek. This small colony fails to breed successfully in most years due to predation, flooding of nest sites or both (RPS, 2014). The proposed M28 Road Project will not directly impact upon key feeding or breeding habitats which sustain Common Tern in Cork Harbour SPA. Indirect impacts to this species through the deterioration of water quality in Cork Harbour will be mitigated through construction phase mitigation and the proposed drainage design during the project's operational phase. Mitigation and best practice scheme design will avoid potential impacts to the water quality of Cork Harbour SPA. Furthermore, the proposed road project will not result in indirect disturbance effects, through construction and operational phase activities to the Common Tern populations associated with Cork Harbour SPA.
Distribution: breeding colonies	Number; location; area (hectares)	No significant Decline	
Prey biomass available	Kilogrammes	No significant decline	
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase	
Disturbance at the breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding common tern population	

¹² Source: NPWS (2014) Conservation Objectives: Cork Harbour SPA 004030. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

5.3.1.2 Attributes for Great Island SAC

Great Island Channel SAC is designated for 2 no. Annex I habitats. Attributes and proposed targets to maintain favourable conservation condition for both of these habitats, in addition to potential impacts are presented in **Table 5.5** below.

Table 5.5: Site Specific Conservation Objectives, Attributes and Targets for Great Island Channel SAC (NPWS, 2014b)

Conservation Objectives of Great Island Channel SAC			
Mudflats and Sandflats Not Covered by Seawater at Low Tide (1140)			
Attribute	Measure	Target	Potential Impact
Habitat Area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes	The mudflat and sandflat habitat area associated with this Annex I habitat will not be impacted by the proposed scheme due to the remote and tenuous connectivity between the proposed M28 Road Project and this European site. There will be no loss or deterioration in area for this Annex I habitat.
Community Distribution	Hectares	Conserve the following community type in a natural condition: Mixed sediment to sandy mud with polychaetes and oligochaetes community complex.	The community distribution and condition of this Annex I habitat will not be impacted by the proposed scheme due to the remote and tenuous connectivity between the proposed M28 Road Project and this European site.
Atlantic Salt Meadows (<i>Glauco-Puccinellietalia Maritimae</i>) (1330)			
Attribute	Measure	Target	Potential Impact
Habitat Area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Bawnard - 0.29ha; Carrigtohill - 1.01ha. See map 5	Atlantic Salt Meadows (1330) associated with Great Island Channel SAC will not be impacted by the proposed scheme due to the remote and tenuous connectivity between the proposed M28 Road Project and this European site. There will be no loss or deterioration in area for this Annex I habitat.
Habitat Distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 5 for known distribution	Due to the remote and tenuous connectivity between the proposed M28 Road Project and this European site, there will be no decline or change in habitat distribution of this Annex I habitat.
Physical Structure: Sediment Supply	Presence / absence of physical barriers	Maintain/restore natural circulation of sediments and organic matter, without any physical obstructions	The physical structure of this Annex I habitat will not be impacted by the proposed scheme development due to the remote and tenuous

Conservation Objectives of Great Island Channel SAC			
Physical Structure: Creeks and Pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	connectivity between the scheme and the Great Island Channel SAC.
Physical Structure: Flooding Regime	Hectares flooded; frequency	Maintain natural tidal regime	
Vegetation Structure: Zonation	Occurrence	Maintain range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	The vegetation zonation and range of this Annex I habitat will not be impacted by the proposed scheme development to the remote and tenuous connectivity between the scheme and the Great Island Channel SAC.
Vegetation Structure: Vegetation Height	Centimetres	Maintain structural variation within sward	The vegetation structure and sward variation of this Annex I habitat will not be impacted by the proposed scheme development due to the remote and tenuous connectivity between the scheme and the Great Island Channel SAC.
Vegetation Structure: Vegetation Cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% area outside creeks vegetated	
Vegetation Composition: Typical Species and Sub-Communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in SMP (McCorry and Ryle, 2009)	The vegetation composition of this Annex I habitat will not be impacted by the proposed scheme development due to the remote and tenuous connectivity between the scheme and the Great Island Channel SAC.
Vegetation Structure: Negative Indicator Species – <i>Spartina Anglica</i>	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Bawnard - 0.29ha; Carrigatohil - 1.01ha. See map 5	The vegetation structure of this Annex I habitat will not be impacted by the proposed scheme development to the remote and tenuous connectivity between the scheme and the Great Island Channel SAC.

5.4 IN-COMBINATION EFFECTS

5.4.1 Methodology

In order to ensure all impacts upon European sites within the project's ZoI were considered, including those direct and indirect impacts that are a result of cumulative impacts, the following steps were completed:

1. Identify all projects/ plans which might act in combination: identify all possible sources of effects from the project or plan under consideration, together with all other sources in the existing environment and any other effects likely to arise from other proposed projects or plans;
2. Impacts identification: identify the types of impacts that are likely to affect aspects of the structure and functions of the site vulnerable to change;
3. Define the boundaries for assessment: define boundaries for examination of cumulative effects; these will be different for different types of impact and may include remote locations;
4. Pathway identification: identify potential cumulative pathways (e.g., via water, air, etc.; accumulations of effects in time or space);
5. Prediction: prediction of magnitude/ extent of identified likely cumulative effects, and
6. Assessment: comment on whether or not the potential cumulative impacts are likely to be significant.

A search of Cork County Council planning enquiry system (<http://maps.corkcoco.ie/planningenquiryv3/LAResources/info.aspx>) was conducted for developments that may have in-combination effects on European Sites with the proposed M28 Road Project. Plans relevant to the area were searched in order to identify any elements of the plans that may act cumulatively or in-combination with the proposed development.

Based on this search and the Project Teams knowledge of the study area a list of those projects and Plans which may potentially contribute to Cumulative or In-Combination Impacts with the proposed M28 Road Project was generated for as listed in **Table 5.6** below.

Table 5.6: Cumulative and In-combination effects of Other Plans and Projects

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
<p>Cork County Development Plan 2014 -2020</p>	<p>There are two main documents which underpin the direction of spatial development in County Cork. Firstly, at a National level the National Spatial Strategy and secondly at a Regional level, the South West Regional Planning Guidelines (SWRPG)</p> <p>The National Spatial Strategy 2002- 2020 (NSS) generally proposes a more balanced pattern of spatial development for the state as a whole, based on continued growth in Greater Dublin but with a significant improvement in the rate of development in nine ‘Gateway’ cities and nine ‘Hub’ towns. The strategy emphasises the critical role of ‘Gateways’ and ‘Hubs’ in delivering future economic growth and designates Metropolitan Cork as a ‘Gateway’ and Mallow as a ‘Hub’ town.</p> <p>(SWRPG) prepared by the South West Regional Authority provides a broad canvas to steer the sustainable growth and prosperity of the region in line with the key principles of the national strategy. The Regional Planning Guidelines adopted in July 2010, set out the agreed population targets for growth to 2022 and for the first time, planning authorities now have to ensure that their development plans are consistent with them. The population targets in this core strategy are consistent with the 2022 population targets set out in the Regional Planning Guidelines.</p> <p>Development Plan Objectives</p> <p>CS 4-1: County Metropolitan Cork Strategic Planning Area</p> <p>d)In the Cork Harbour area generally, to protect and enhance the area’s natural and built heritage and establish an appropriate balance between competing</p>	<p>Positive Impacts – The following objective is set out in the Cork County Development Plan 2014-2020 for the protection of the European sites:</p> <p>H-E 2.1 – Site Designated for Nature Conservation</p> <p>Provide protection to all Natural Heritage sites designated or proposed for designation under National or European legislation and International Agreements, and to maintain or develop linkages between these. This includes Special Areas of Conservation, Special Protection Areas, Natural Heritage Areas, Refuges for Fauna and Ramsar sites.</p> <p>Objectives H-E 2.2, H-E 2.3, H-E 2.4, H-E 2.5, H-E 2.6 and H-E 2.7 all provide supporting functionality for the protection of European sites within the Cork County development plan area.</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>landuse to maximise the areas overall contribution to Metropolitan Cork while protecting the environmental resources of the Harbour;</p> <p>e) Assist in the redevelopment of the Cork City Docklands by providing for the relocation and development of industrial uses and major port facilities, primarily at Ringaskiddy, to where deepwater berths are viable and appropriate infrastructure is planned to facilitate freight transport.</p> <p>CS 3-1: Network of Settlements: Higher Order Settlements Gateway, Hub and Main Settlements</p> <p>Strategic Aim (City Environs – North and South)</p> <p>Growth in population and employment so that the Cork Gateway can compete effectively for investment and jobs. Develop to complement & consolidate the development of the city as a whole and providing enhanced potential to rebalance the City through new development in the north.</p> <p>Strategic Aim (City Environs - East and West)</p> <p>Consolidate employment at existing employment locations and planned for employment locations (Cork Science and Innovation Park) with improved supporting infrastructure, and in particular public transport improvements to provide linkages to local residential populations and Cork City.</p> <p>Strategic Aim (Metropolitan Towns (Including Carrigaline))</p> <p>Critical population growth, service and employment centres within the Cork “Gateway”, providing high levels of community facilities and amenities with infrastructure capacity high quality and integrated public transport connections should be the location of choice for most people especially those with an urban</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>employment focus.</p> <p>Development Plan Objectives</p> <p>County Development Plan Objective TM 3-1: National Road Network</p> <p>a) Seek the support of the National Roads Authority in the implementation of the following major projects:</p> <p>Projects Critical to the Delivery of Planned Development</p> <ul style="list-style-type: none"> • M28 (Cork – Ringaskiddy). • M8 (Dunkettle Interchange Upgrade). • Cork Northern Ring Road (N22/N20/M8). <p>Key NSS Projects</p> <ul style="list-style-type: none"> • M20 (Blarney – Mallow – Limerick). • N25 (Carrigtohill – Middleton – Youghal). <p>Key Regional Projects</p> <ul style="list-style-type: none"> • N22 (Ballincollig – Macroom – Ballyvourney) to include Macroom Bypass. • N71 (Cork – Clonakilty – Skibbereen and Bantry). • N72 (Mallow Northern Relief Road). • N72 Mallow to Fermoy. • N73 (Mallow – Mitchelstown). <p>County Development Plan Objective TM 3-2: Regional & Local Roads</p> <p>a) Recognise the strategic role played by Regional Roads within the County and, together with Local Roads, to enhance their carrying capacity and safety profile in line with demand.</p> <p>b) Promote the improvement of strategic Regional and Local Roads throughout the County in accordance with the strategies identified for the main settlements in</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>this Plan.</p> <p>c) Seek funding for the following Regional and Local Roads Projects in the County (including the Carrigaline Inner Relief Road).</p> <p>County Development Plan Objective TM 5-2: Cork and Other Ports</p> <p>a) Ensure that the strategic port facilities at Ringaskiddy, Whitegate and Cork Airport have appropriate road transport capacity to facilitate their sustainable development in future years. See also Objective EE 62: Cork Harbour</p> <p>b) Support the relocation of port activities and other industry away from the upper harbour on the eastern approaches to the city. See also Objective EE 62: Cork Harbour</p> <p>c) Support Ringaskiddy as the preferred location for the relocation of the majority of port related activities having regard to the need for a significant improvement to the road network.</p> <p>County Development Plan Objective HE 2-3: Biodiversity outside Protected Areas</p> <p>Retain areas of local biodiversity value, ecological corridors and habitats that are features of the County's ecological network, and to protect these from inappropriate development. This includes rivers, lakes, streams and ponds, peatland and other wetland habitats, woodlands, hedgerows, tree lines, veteran trees, natural and semi-natural grasslands as well as coastal and marine habitats. It particularly includes habitats of special conservation significance in Cork as listed in Volume 2 Chapter 3 Nature Conservation Areas of the plan.</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>County Development Plan Objective HE 2-4: Protection of Wetlands</p> <p>Ensure that an appropriate level of assessment is completed in relation to wetland habitats subject to proposals which would involve drainage or reclamation. This includes lakes and ponds, watercourses, springs and swamps, marshes, heath, peatlands, some woodlands as well as some coastal and marine habitats.</p> <p>County Development Plan Objective HE 2-5: Trees and Woodlands</p> <p>a) Protect trees the subject of Tree Preservation Orders.</p> <p>b) Preserve and enhance the general level of tree cover in both town and country. Ensure that development proposals do not compromise important trees and include an appropriate level of new tree planting and where appropriate to make use of tree preservation orders to protect important trees or groups of trees which may be at risk or any tree(s) that warrants an order given its important amenity or historic value.</p> <p>c) Where appropriate, to protect mature trees/groups of mature trees and mature hedgerows that are not formally protected under Tree Preservation Orders.</p> <p>County Development Plan Objective HE 2-7: Control of Invasive Species</p> <p>Control the spread of invasive plant and animal species within the county.</p>	
<p>Cork County Development Plan 2014 – 2020 Stage 2: Natura Impact Report</p>	<p>This Natura Impact Report represents the final stage of Appropriate Assessment for the Cork County Development Plan. It summarises how Appropriate Assessment was integrated into each part of the County Development Plan and determines the</p>	<p>Assessment and identification of policies and objectives associate with the development plan that could impact European sites as part of the AA process. Subsequent amendment of policies and objectives to ensure compliance with the Habitats Directive and to</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	likelihood of impact associated with the various objectives and strategies comprising the County Development Plan.	ensure no potential impacts to European sites. No Potential for Impact.
Cork Biodiversity Action Plan 2009 -2014	<p>The overall aim of the County Cork Biodiversity Action Plan is to conserve and to enhance biodiversity, and to ensure that every person in the county has the opportunity to appreciate and understand its importance in our lives.</p> <p>Objective 1: To Review Biodiversity Information For County Cork and To Prioritise Habitats and Species For Conservation Action.</p> <p>Objective 2: To Collect Data And Use It To Inform Conservation Action And Decision Making.</p> <p>Objective 3: To Incorporate Positive Action For Biodiversity Into Local Authority Actions And Policy.</p> <p>Objective 4: To Promote Best Practice In Biodiversity Management And Protection.</p> <p>Objective 5: To Facilitate The Dissemination Of Biodiversity Information.</p> <p>Objective 6: To Raise Awareness Of County Cork's Biodiversity And Encourage People To Become Involved In Its Conservation.</p>	<p>The objectives underpinning this assessment will have a positive impact on nature conservation in the county and by extension European sites. The implementation of this plan, particularly the incorporation of positive biodiversity actions into Local Authority Plans and Policies will have a strategic influence on nature conservation in the county including the county's European sites.</p> <p>Overall Positive Impact</p>
Draft Ballincollig-Carrigaline Municipal District Area Local Area Plan 2017	<p>The policies and objectives of this Plan provide a framework for sustainable development responding to the needs of communities within the Municipal District. Once finalised this Plan will replace the previous Electoral Area Local Area Plans adopted in 2011. Carrigaline is divided between two Municipal Districts but for the purposes of this plan is being treated as one area. This section is also replicated in the Bandon/Kinsale Municipal District Local Area Plan. The following objectives are of relevance:</p>	<p>Neutral to Positive Impacts – Overarching and specific objectives provided to consider potential impacts to European sites and the designated site network as a whole. Plans and projects based on the plans and proposals within the LAP to be subject to the Appropriate Assessment process.</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>LAS-01 –</p> <p>a) In order to secure sustainable population growth proposed in each Main Town appropriate and sustainable water and waste water infrastructure that will help secure the objectives of the relevant River Basin Management Plan, needs to be provided in tandem with the development and where applicable protect the integrity of Natura 2000 sites.</p> <p>b) This plan, and individual projects based on the plans proposals, will be subject (as appropriate) to Strategic Environmental Assessment, Habitats Directive Assessment Screening and/or Assessment (Habitats Directive and Birds Directive) and Environmental Impact Assessment to ensure the parallel development and implementation of a range of sustainable measures to protect the integrity of the biodiversity of the area.</p> <p>c) Provide protection to all proposed and designated natural heritage sites and protected species within this planning area in accordance with HE2-1, and HE2-2 of the County Development Plan, 2014. This includes Special Areas of Conservation, Special Protection Areas and Natural Heritage Areas.</p> <p>d) Maintain where possible important features of the landscape which function as ecological corridors and areas of local biodiversity value, wetlands and features of geological value within this planning area in accordance with HE2-3, 2-4,2-5, and 2-6 of the County Development Plan, 2014.</p> <p>CARRIGALINE</p> <p>CL-GO-02: Environmental Designations In order to secure sustainable population growth proposed in GO -01 (a), appropriate and sustainable water and</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>wastewater infrastructure that will help secure the objectives of the relevant River Basin Management Plan, needs to be provided in tandem with the development and where applicable, protect the integrity of Natura 2000 sites. Carrigaline is situated adjacent to Cork Harbour Special Protection Area and in proximity to the Great Island Channel SAC. This plan will protect the favourable conservation status of these sites, and all new development shall be designed to ensure the protection and enhancement of biodiversity generally. Development proposals in unzoned parts of the settlement adjacent to the SAC and SPA will be likely to require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the requirements of the Habitats Directive and may only proceed where it can be shown that they will not have significant negative impact on these sites.</p> <p>CL-GO-03: Development Boundary The boundary of Carrigaline overlaps with and is adjacent to the Cork Harbour Special Area of Conservation and the Cork Harbour Special Protection Area. Development in the town will only be permitted where it is shown that it is compatible with the requirements of the Habitats Directive and the protection of these sites. Protection and enhancement of biodiversity resources within the receiving environment of the town will be encouraged.</p> <p>CL-U-05: Provide pedestrian walkway along old railway line from the river north towards Ballyhemiken.</p> <p>RINGASKIDDY RY-I Objectives 01 & 02; 06-19:</p> <p>Lands zoned for industrial development located in</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	proximity of Cork Harbour SPA.	
<p>Carrigaline Electoral Area Local Area Plan 2015</p>	<p>This plan provides a detailed planning framework for sustainable development responding to the needs of communities within the Carrigaline Electoral Area. It aims to deliver quality outcomes, based on consensus, that have been informed by meaningful and effective public participation.</p> <p>LAS 2-2 - This plan, and individual projects based on the plans proposals, will be subject (as appropriate) to Strategic Environmental Assessment, Habitats Directive Assessment Screening and/or Assessment (Habitats Directive and Birds Directive) and Environmental Impact Assessment to ensure the parallel development and implementation of a range of sustainable measures to protect the integrity of the biodiversity of the area.</p> <p>LAS 2-3 - It is an objective to provide protection to all proposed and designated natural heritage sites and protected species within this planning area in accordance with ENV 1-5, 1-6, 1-7 and 1-8 of the County Development Plan, 2009. This includes Special Areas of Conservation, Special Protection Areas and Natural Heritage Areas.</p> <p>LAS 2-4 - It is an objective to maintain where possible important features of the landscape which function as ecological corridors and areas of local biodiversity value and features of geological value within this planning area in accordance with ENV 1-9, 1-10, 1-11 and 1-12 of the County Development Plan , 2009.</p>	<p>Neutral to Positive Impacts – Overarching and specific objectives provided to consider potential impacts to European sites and the designated site network as a whole. Plans and projects based on the plans and proposals within the LAP to be subject to the Appropriate Assessment process.</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>I01 - Industry including ancillary uses such as associated offices, laboratories, manufacturing and utilities. The open space zonings in specific objectives O- 01 and O-02 shall be provided as part of this development. This zone is adjacent to Cork Harbour Special Protection Area. Development proposals in this zone are likely to require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the requirements of the Habitats Directive and may only proceed where it can be shown that they will not have significant negative impacts either alone or in combination with other projects on the SPA or on species for which the SPA is designated</p> <p>U-06 - Pedestrian walkway along river bank to Ballea Road. Development of this walk could give rise to disturbance to winter feeding sites and will require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the requirements of the Habitats Directive.</p> <p>U-07 - Pedestrian walkway along shoreline towards Coolmore. Development of this walk could give rise to disturbance to winter feeding sites and will require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the requirements of the Habitats Directive. The development of the walk may only proceed where it can be shown that it will not have an impact on the adjacent Special Protection Area.</p> <p>R-04 - Medium B density residential development. Development proposals in this zone will require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>requirements of the Habitats Directive and may only proceed where it can be shown that they will not have significant negative impacts either alone or in combination with other projects on the adjacent SPA. A sea wall will be required along the eastern / southern boundary of the site.</p> <p>The timing and provision of appropriate drinking water and waste water disposal services for the development must be agreed with the Council before the layout and design of the development is commenced. This may include the provision of off-site and on-site infrastructure. Specific arrangements shall be made for the provision and construction an amenity walk (U-07).</p> <p>I-18 - Port Facilities and Port Related Activities. This zone is adjacent to the Cork Harbour Special Protection Area and partially overlaps Monkstown Creek proposed Natural Heritage Area. Development proposals in this zone are likely to require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the requirements of the Habitats Directive and may only proceed where it complies with procedures set out in Article 6 of the Habitats Directive.</p> <p>X-03 - Special Policy Area for sustainable harbour related recreation and tourism opportunities which will allow for improved public access to the water. This zone is adjacent to the Cork Harbour Special Protection Area. Development proposals may require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the requirements of the Habitats Directive and may only proceed where it can be shown that neither they nor the activities that they may generate will have</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	significant negative impacts either alone or in combination with other projects on the SPA or on species for which the SPA is designated.	
Natura Impact Report for Carrigaline Electoral Area 2015	The Natura Impact Report for the Carrigaline Electoral Area Local Area Plan, 2011-2017 summarises how all of the recommendations arising from the initial Natura Impact Reports, and how ecological considerations generally, have been integrated into the Local Area Plan. It also contains the details of the monitoring measures which will be implemented to ensure that the undertakings in relation to the protection of the Natura 2000 network, as set out in the Local Area Plan, are met. Finally the report contains the AA Conclusion Statement which finds that, subject to a number of changes to text, objectives, settlement boundaries and zonings, which have been accepted by the Council and are contained in the final plan, there will be no significant impact on the network as a whole, nor to individual Natura 2000 sites or their dependant habitats and species.	Assessment and identification of policies and objectives associate with the development plan that could impact European sites as part of the AA process. Subsequent recommended amendments of policies and objectives to ensure compliance with the Habitats Directive and to ensure no potential impacts to European sites.
Southern River Basin District Management Plan (SRBDMP) 2009 -2015	The Western International RBD Management Plan, issued in July 2010, sets out a number of objectives and measures for all water bodies in the Northwestern International Region. Objectives: Ensure that the status of waters supporting protected areas is protected and (where necessary) improved by 2015. Measures: Implement 11 EU Directives, 9 other basic requirements.	The implementation and compliance with the environmental objectives of the SRBDMP will result in net positive in-combination effects to European sites. The implementation of this River Basin Management Plan 2009-2015 will have a Positive impact for watercourses in the southern region. It will not contribute to in-combination or cumulative impacts with the proposed M28 Road Project.
NPWS Conservation Management Plans	Conservation Management Plans have not yet been published for the European sites within the project's zone of influence. However the general and site specific conservation objectives have been published for these European sites.	The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. Generic and site-specific conservation objectives aim to define favourable conservation condition for a particular habitat or species at that site to ensure the ecological

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
		<p>integrity of these sites is maintained or restored. The resultant effects of conservation objectives are a net positive and there is no potential for adverse in combination effects on European Sites. These plans will not contribute to in-combination or cumulative impacts with the proposed M28 Road Project.</p>
<p>Local Planning Applications¹³</p>	<p>Various local planning applications in proximity and within the Zone of Influence of the proposed road project.</p>	<p>Adherence to the overarching policies and objectives of the Cork County Development Plan 2015 - 2020 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 and environmental considerations, there is no potential for adverse in combination effects on European Sites.</p>
<p>Redevelopment of Existing Port Facilities at Ringaskiddy ABP PLO4.PA0035</p>	<p>Redevelopment of existing port facilities at Ringaskiddy, Co. Cork, incorporating:</p> <ul style="list-style-type: none"> - Ringaskiddy East (Container berths and Multi-Purpose berth) - Ringaskiddy West (Deepwater Berth Extension) - Paddy's Point amenity area, - Road improvements and external road works, & - Associated development works 	<p>Potential for in-combination negative impacts where mitigation measures not be implemented for this development and the proposed M28 Road Project.</p> <p>The improvement to the port facilities will likely increase vessel activity in the area with an associated increase in underwater noise and risks of collisions for marine mammals, but it is considered that the impacts of this will not be significant on both the individual and population level for marine mammal species that frequent the area. There is also potential for pollution impacts during operation. The construction and</p>

¹³ The Local Planning Applications included in this potential in-combination impacts assessment support the following criteria; planning applications granted within the past five years that may contribute to potential cumulative impacts on European sites of concern. They include planning applications that support proximity or potential connectivity with proximal sections of Cork Harbour SPA such as Monkstown Creek, Douglas River Estuary or Lough Beg. Their development and operation could in-combination with the proposed N28 upgrade scheme provide in-combination impacts to those screened in European sites.

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
		<p>operation of the proposed redevelopment has the potential to cause disturbance to otter. The proposed redevelopment has the potential to impact on bird species during operation with the potential for direct and indirect loss of habitat and food resources, visual and noise disturbance, increased predation risk and pollution. No significant residual effects upon terrestrial ecology or ornithology are predicted.</p>
<p>Dunkettle Interchange Improvement Motorway Scheme 2012 - CPO / EIS ABP PL04G.HA0039 - Motorway Scheme: Compulsory Order and /PL04G.MA0011- Motorway Scheme: Environmental Impact Statement.</p>	<p>"43 major structures of various forms comprising:</p> <ul style="list-style-type: none"> - 1 overbridge, - 7 underbridges, - 2 railway bridges, - 1 footbridge, - Modification of the northern approach structure to the Jack Lynch Tunnel - 7 retaining walls and 24 gantries, - Several culverts where the scheme crosses watercourses or intertidal areas - Pedestrian and cyclist facilities, together with ancillary and consequential works." <p>The findings of ABP Inspectors report on the NIS prepared for this scheme is as follows:</p> <p><i>Subject to the satisfactory implementation of the design mitigation, (which includes the proposed three stage surface water storage and treatment system of petrol interceptors, initial attenuation ponds and constructed wetlands) and compliance with the proposed mitigation measures specified in the revised schedule of commitments submitted to the Inspector at the Hearing on 9th January, 2013, to ameliorate risk of disturbance, sediment and pollutant release and invasive species spread during the construction phase, no significant adverse impact on the integrity of the SPA would occur and that no significant cumulative or</i></p> 	<p>This development is unlikely to contribute to cumulative or in-combination effects provided best practice and mitigation measures are implemented, as outlined in the EIS & NIS prepared for this project.</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
<p>East Tip Remediation Project ABP PL04.MT0001</p>	<p><i>residual negative impacts would occur.</i></p> <p>“Demolish and clear existing structures (including 3 no. buildings on site)</p> <ul style="list-style-type: none"> - Re-profile the site, - Construct a perimeter engineered structure (PES) and an engineered capping system with surface water drainage system – the PES would include a rock arbour on the sea side, - The provision of a public park on the site, - The provision of a playing pitch to replace the existing naval facility, - 2 no. 2-lane access roadways to provide segregated access from Haulbowline Bridge to the proposed public park and to the naval dockyard, with associated revised security arrangements, - Provision of new footpaths.” <p>Findings of the Natura Impact Statement for the scheme are as follows:</p> <p>The key potential pathways for impacts would be through possible contamination of the food chain from the disturbance of waste, and direct disturbance of birds feeding or roosting in the vicinity.</p> <p>Secondary impacts could be through the disturbance of sediments, the spread of invasive species, and light/vibration/noise during construction works. The NIS looked at direct and indirect impacts, as well as in-combination effects concluding that subject to appropriate controls the proposal will not adversely affect the integrity of the EU sites.</p> <p>Section 4.5.1 of the NIS sets out proposed mitigation for the construction phase and 4.5.2 sets out</p>	<p>This development is unlikely to contribute to cumulative or in-combination effects provided best practice and mitigation measures are implemented, as outlined in the NIS prepared for this project.</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	mitigation for the end use and aftercare stage.	
<p>DePuy Synthes Turbine CCC 15/6967</p>	<p>Erection of a wind turbine with hub height of up to 100m, rotor radius of up to 50.5m and overall height from ground to tip of rotor of up to 150.5m, upgrade of existing site roads, and all other associated works.</p> <p>An NIS and Environmental Impact Statement completed for this development. The NIS concluded that with the implementation of mitigation measures, that there will be no risk of significant adverse effects of the proposed development on Cork Harbour SPA.</p>	<p>This development is unlikely to contribute to cumulative or in-combination effects provided best practice and mitigation measures is implemented, as outlined in the EIS & NIS prepared for this project.</p>
<p>Cobh Cruise Berth CCC. 14/5807and ABP PL 04.244386</p>	<p>A new mooring dolphin structure immediately adjacent to the existing wall at Five Foot Way and 2 no. isolated mooring dolphin structures with mooring bollards, 2 no. access bridges and associated engineering works comprising piling and rock anchoring</p>	<p>Potential in-combination impacts to Cork Harbour SPA during the projects construction and operational phases to disturbance and consequent avoidance of avifaunal species from roosting and feeding sites within nearby areas of Cork Harbour SPA.</p>
<p>Martello Tower Site Reprofilng CCC 16/6219</p>	<p>Excavate soil and topsoil materials from a site and subsequent re-profilng and remediation of the site.</p> <p>AA was completed for this proposal assessing potential impacts to European sites, in particular the proximal areas of Cork Harbour SPA. The findings of the AA concluded that the study site does not support wintering waterbirds that represent a significant portion of the populations in Cork Harbour SPA and will not impact this European site.</p>	<p>This development is unlikely to contribute to cumulative or in-combination effects provided best practice and mitigation measures are implemented, as outlined in the EIS & NIS prepared for this project.</p>
<p>Indaver Waste to Energy Facility PL04 .PA0045</p>	<p>Development of a Waste to Energy Facility for the treatment of up to 240,000 tonnes per annum of residual household, commercial, industrial, non-hazardous and suitable hazardous waste.</p>	<p>This development is unlikely to contribute to cumulative or in-combination effects to Cork Harbour SPA provided best practice and mitigation measures are implemented for this project to attenuate emissions to receptors such as air, watercourses and the surrounding terrestrial environment.</p> <p>Furthermore, the footprint of this development does not support suitable habitat for avifaunal species</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
		<p>associated with Cork Harbour SPA and the findings of avifaunal surveys completed for this development did not identify this area as a suitable or viable site for over-wintering avifauna associated with Cork Harbour SPA.</p>
<p>Shannonpark Roundabout Housing Development CCC 16/4289</p>	<p>Demolition of a farmhouse and three outbuildings and the construction of a mixed use development consisting of residential development of 297 no. residential units, neighbourhood centre, public transport interchange and all ancillary site development works. The proposed development is Phase 1 of development envisaged by Astra Construction Services Ltd. and further phases will be subject to subsequent planning applications. The proposed 297 no. residential units consists of 46 no. detached dwellings, 230 no. semi-detached dwellings, 7 no. terraced units and 14 no. apartments to be provided in a two storey block with ancillary spaces including common/meeting room, laundry and storage rooms and management office. The proposed neighbourhood centre is 3 storeys in height and provides for 2 no. retail units, pharmacy and office/medical unit on ground floor level with ancillary yard areas, a 2 storey crèche on ground and first floor levels, office/medical use on first and second floor level and rooftop plant. Access to the proposed development will be via a new spine road from the Carrigaline Road which will also serve possible future phases of development. The proposed roadworks include road widening and the provision of a new signalised junction opposite the existing entrance to Carrig na Curra. The ancillary site development works consist of the diversion of the existing Raffeen Trabeg 110 kV ESB electrical cables and the diversion and undergrounding of the existing 38 kV ESB electrical</p>	<p>This development is unlikely to result in cumulative or in-combination effects to European sites. The footprint of this development does not support suitable habitat for avifaunal species associated with Cork Harbour SPA and the findings of avifaunal surveys completed for this development did not identify this area as a suitable or viable site for over-wintering avifauna associated with Cork Harbour SPA. Drainage design and water attenuation mitigation is proposed for this development restricting un-attenuated run-off to receiving watercourses including the Glounatouig Stream which supports connectivity to Monkstown Creek designated as part of Cork Harbour SPA.</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	cables, the diversion of an existing stream and all ancillary ground works including car parking, fencing and landscaped linear wetland park. The proposed public transport interchange is located adjacent to the proposed neighbourhood centre and provides for 50 no. car parking spaces.	
Marina at Whitepoint, Cobh CCC 10/52015	Installation of 74 berth marina with access platform and gangway, underground water treatment unit and associated infrastructure.	Potential in-combination impacts to Cork Harbour SPA during the projects construction and operational phases to disturbance and consequent avoidance of avifaunal species from roosting and feeding sites within Cork Harbour SPA.
Monkstown Marina CCC 15/4446 (Extension of Duration of 08/9317) and ABP PL04.236980	(a) Construction of a marina to provide 285 number berths, (b) construction of a three-storey over basement marina building to include cafe/bar/restaurant, gym, provision shop, public toilets, changing room, chandlery, marine training room, boat sales office, marina management office, public toilets, (c) dedicated gated rowing club, (d) 174 car parking spaces, (e) rock armour protection, (f) diesel and petrol refuelling facilities, (g) reclamation of foreshore to provide for the above, and (h) associated site works to include landscaping, pilling and underground bunded fuel tanks - Extension of duration to permission granted under Planning Reg. No. 08/9317 and PL04.236980.	Potential in-combination impacts to Cork Harbour SPA during the projects construction and operational phases due to disturbance and consequent avoidance of avifaunal species, particularly Common Tern, from breeding sites within nearby sections of Cork Harbour SPA. However, this development is unlikely to contribute to cumulative or in-combination effects provided best practice and mitigation measures are implemented, as outlined in the EIS & NIS prepared for this project.
Development of Pedestrian Cycle Greenway - Glenbrook to Raffeen Part 8 Planning Application	Greenway development situated along an abandoned railway line between Glenbrook and Raffeen. This proposed development is proximal to the Monkstown Creek portion of Cork Harbour SPA and could present in-combination impacts to this section of the European site.	This development has the potential for in-combination or cumulative impacts to Cork Harbour SPA given its proximity to Monkstown Creek which is designated as part of Cork Harbour SPA. Screening for AA has been prepared for this development considering potential impacts to European sites which include Cork Harbour SPA. This scheme has been designed to incorporate screen planting and physical barriers avoiding potential disturbance effects to avifaunal populations associated

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
		with Monkstown Creek and by extension Cork Harbour SPA. The Screening for AA completed for this development concluded that there will be no material impacts arising from the proposed M28 Road Project on European sites.
<p>Raffeen Quarry – Ballyhemiken CCC 06/10037 and ABP PL.04.225610</p>	<p>Continuation of quarrying activities to include processing of aggregates, landscaping, restoration and associated works under the existing Planning Permission.</p>	<p>Quarrying operations at Raffeen Quarry will not contribute to cumulative or in-combination impacts to Cork Harbour SPA. Quarrying operations to be regulated by terms of planning to include attenuation of water run-off to the Glounatouig stream which is a tributary of Cork Harbour SPA. In addition, Raffeen Quarry or its immediate surrounds do not support suitable habitat for over-wintering avifauna associated with Cork Harbour SPA, therefore quarrying activities will not contribute to disturbance effects to SCI species for this European site.</p>
<p>Cork Lower Harbour Main Drainage Scheme 04.YA0005 and 04.YM0001 (Alterations to 04.YA0005) and 04.YM0003 (Amendment to decision on LA Foreshore)</p>	<p>The Cork Lower Harbour Main Drainage Project will aim to provide enhanced wastewater treatment through the development of a new wastewater treatment plant at Shanbally County Cork. This project will significantly enhance the water quality in Cork Harbour. Currently, wastewater from Cobh, Carrigaline, Passage West/Monkstown and Ringaskiddy is discharged untreated into the Harbour.</p> <p>The Cork Lower Harbour Main Drainage Project consists of:</p> <ul style="list-style-type: none"> - A new wastewater treatment plant - 14 new pumping stations - Approximately 30km of new sewers and a drilled crossing under the estuary - Development to take place in Cobh, Carrigaline (including Crosshaven), Passage West/Monkstown (including Glenbrook) and 	<p>Potential for in-combination effects to Cork Harbour SPA during the projects construction phases due to deterioration of water quality and disturbance effects to SCI species. However, this development is unlikely to contribute to cumulative or in-combination effects provided best practice and mitigation measures are implemented, as outlined NIS prepared for this project.</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	Ringaskiddy (including Shanbally and Coolmore) County Cork.	
<p>Janssen Biologics Planning applications to Cork County Council 13/6217, 144676, 145899, 145993, 146417, 146678, 154919, 155315, 167150</p>	Multiple planning applications for building upgrades, parking and ancillary developments	Adherence to the overarching policies and objectives of the Cork County Development Plan 2015 - 2020 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 and environmental considerations, there is no potential for adverse in combination effects on European Sites.
<p>Novartis Planning applications to Cork County Council 134764, 135727, 135759, 145395 & 164146</p>	Construction of new production facilities, storage units and ancillary upgrade works	Adherence to the overarching policies and objectives of the Cork County Development Plan 2015 - 2020 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 and environmental considerations, there is no potential for adverse in combination effects on European Sites.
<p>GE Healthcare Life Sciences Biopark</p>	<p>A BioPark and all ancillary site development works including landscaping, fencing and signage. The proposed BioPark consists of no. 2 storey bio-manufacturing buildings, 4 no. 2 storey administration/laboratory buildings with roof top plant room, a 2 storey warehouse building with 6 storey storage tower, a 2 storey hydration facility building, a 2 storey central utilities building with external boiler flues, and a 2 storey canteen and administration building with roof top plant room and service yard.</p> <p>Primary access to the proposed development is from the R613 with a secondary access via an existing entrance from the L2496.</p>	<p>This development is unlikely to contribute to cumulative or in-combination effects to Cork Harbour SPA provided best practice and mitigation measures are implemented for this project to attenuate emissions to receptors such as air, watercourses and the surrounding terrestrial and coastal environments.</p> <p>The AA Screening undertaken for this development considered the SCI species for Cork Harbour SPA <i>are not expected to be present at or reliant on the habitats and resources available within the footprint or adjacent to the development site and the risk of disturbance to wintering birds feeding or roosting within the Cork Harbour Special Protection Area (SPA) is low and it is</i></p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
		<i>unlikely that the proposed works would cause significant disturbance or displacement impacts on the SCI bird species..</i>
<p>Maryborough Ridge Housing Development Planning application to Cork County Council 167271</p>	<p>Residential development works to include 200 no. residential units, crèche and all associated ancillary development works including the completion of a roundabout and road improvements onto Maryborough Hill, footpaths and cycle lanes, bus stop, foul and storm water drainage, boundary treatments, landscaping and amenity areas and the removal of existing electricity transformer/substation and construction of new electricity substation.</p>	<p>This development is unlikely to contribute to cumulative or in-combination effects to Cork Harbour SPA provided best practice and mitigation measures are implemented for this project to attenuate emissions to receptors such as air, watercourses and the surrounding terrestrial and coastal environments.</p>

5.5 CONCLUSION OF IMPACT ASSESSMENT

The Cork Harbour area supports a number of developments that have been granted planning permission that could in-combination with the proposed M28 Road Project result in cumulative or in-combination effects to Cork Harbour SPA. However, the large infrastructural developments in the Cork Harbour area have been granted planning permission on the basis that targeted and site specific mitigation is completed to minimise potential impacts to Cork Harbour SPA.

The remote and tenuous connectivity of the Great Island Channel SAC to the proposed M28 Road Project means that potential impacts are unlikely. The implementation of best practice design, construction and operational measures will negate potential impacts to this European site.

All possible sources of effects from the proposed road project, in combination with all other sources in the existing environment and any other effects likely to arise from other proposed plans or projects have been identified.

Robust and effective mitigation measures to avoid and or ameliorate these impacts are provided in **Section 6**.

6 MITIGATION

Mitigation is defined by MN2000 as ‘*measures aimed at minimising or even cancelling the negative impact of a plan or project, during or after its completion*’ (paragraph 4.5.2). Potential impacts identified in the above chapters include the deterioration in the water quality of the study area’s receiving watercourses which support connectivity with Cork Harbour SPA and Great Island Channel SAC. Construction best practice guidance measures and design are provided below to avoid potentially deleterious substances entering receiving watercourses and further downstream to Cork Harbour SPA.

6.1 GENERAL POLLUTION PREVENTION CONTROL MEASURES

As this is a national road project, all elements of the project, including culvert design, realignments and construction methodologies will follow the relevant Transport Infrastructure Ireland (TII) (formerly NRA) guidelines:-

- *Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes* (NRA 2008a);
- *Guidelines for the Treatment of Otters during the Construction of National Road Schemes* (NRA, 2008b), and
- *Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads* (NRA, 2010, rev. 1).

As outlined in **Table 3.1**, the proposed M28 Road Project supports connectivity to Cork Harbour SPA via three streams draining the study area; i.e. Glounatouig Stream, Donnybrook Stream and the Woodbrook Stream. There may also be connectivity to the Glounatouig stream via groundwater conduits between Shanbally and Ringaskiddy. The proposed road is also remotely connected to Great Island Channel via Cork Harbour SPA. Given this interconnectivity, mitigation is required to avoid or intercept potential pollutants from entering watercourses draining the study area.

6.1.1 Construction Phase

The measures described below will ensure that any potential impacts on aquatic ecological receptors and the qualifying features of Cork Harbour SPA and by extension, Great Island Channel SAC, from sedimentation or pollution during both the construction and operational phases are avoided or mitigated.

The project drainage design and mitigation measures for each of the construction impacts are detailed below.

6.1.1.1 Suspended Solids Pollution

The following measures for erosion and sediment control shall be adhered to by the Contractor appointed to undertake the works. These measures are proposed to restrict release of suspended solids from the works area to receiving watercourses, and by extension the downstream and nearby sections of Cork Harbour SPA.

- Sediment traps or settlement ponds shall be provided for all watercourses during construction and will adhere to IFI (2016) Guidelines;
- The level of suspended solids in any discharges to fisheries waters (Woodbrook, Donnybrook and Glounatouig streams) as a consequence of construction works shall not exceed 25 mg/l¹⁴ nor result in the deposition of silts on gravels or any element of aquatic flora and fauna (as per IFI (2016) guidelines);
- Topsoil stripping in proximity to any watercourses will be undertaken in dry weather conditions and all stockpiles will be located greater than 100m from a watercourse. Stockpiles within 200m of a watercourses will be covered;
- Stripped areas will be revegetated, particularly cut and fill slopes and disturbed slopes as soon as possible, e.g., by use of hydroseeding (larger areas), replacement of turves (smaller areas), woodland planting etc. Mulches or other organic stabilisers will be used to minimise erosion until vegetation is established on sensitive or waterlogged soils. Hydroseeding shall not be carried out in close proximity to water and these areas will be seeded by hand or placement turves used;
- Run-off velocities and erosive energy will be minimised by maximising the lengths of flow paths for precipitation run-off, constructing interceptor ditches and transport, and lining unavoidably steep interceptors or conveyance channels with low gradients to minimise secondary erosion, and ditches with filter fabric, rock or polyethylene lining to prevent channel erosion;
- The crossing of watercourses at natural fords will not be permitted due to the uncontrolled sedimentation that can be generated;
- The creation of fords on streams and rivers through the introduction of stone shall be prohibited;
- There will be designation of appropriate locations set back from watercourses and methods for stockpiling soil, aggregates, chemicals, etc;
- Heavy vehicular movements will be restricted adjacent to watercourse and tidal areas in order to avoid inputs;
- The construction of culverts and diversion of streams will be carried out during dry weather/ low flow periods;
- Run-off from stockpiles will be collected via a shallow toe drain which will discharge to a settlement pond. Settlement ponds will be designed and sized to adequately attenuate suspended solid run-off from stockpile areas. Sediment build-up will be removed at regular intervals by manual means only and will be treated at an appropriately authorised waste management facility;
- 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 monitoring points, sediment traps, settlement lagoons and hydrocarbon separators, and
- Excavations for foundations and piles will be carried out so as to minimise sediment run off.

¹⁴ The standard is expressed as an average concentration over a period of 12 months and does not apply to suspended solids with harmful chemical properties. <http://www.irishstatutebook.ie/eli/1988/si/293/made/en/print>

6.1.1.2 Pollution with Other Substances

The following guidelines based on Chilibeck *et al* (1992) and NRA (2005) shall 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 100m 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 100m 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 and reach neutral pH before clarified water is released to the stream or drain system or allowed to percolate into the ground;
- 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.

6.1.1.3 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 Ecological Clerk of Works;
- 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 stage settlement facilities) or alternatively disposed of as waste to a licensed facility.

6.1.1.4 Hydrology Changes

In order to maintain flow velocities and existing channel morphology the construction of culverts and stream diversions will be carried out in line with the guidelines and recommendations of TII, the OPW and IFI. A number of new sections of open channel will be constructed. These open channels will be sized to accommodate the 1 in 100 year flood flow plus an allowance of 20% to account for climate change in line with the requirements of the OPW and TII requirements.

The OPW recommends a minimum culvert dimension of 900mm for any culvert in order to reduce the likelihood of blockage with debris during high flows. New culverts for this route have been designed to accommodate 1 in 100 year flood flows plus 20% for climate change without heading up at the upstream end. In general, culverts will be constructed along the line of the existing watercourse and where possible to a similar width to that of the natural low-flow channel. However, this will have to be balanced with the need to keep culvert lengths to a minimum to allow sufficient natural light to reach the water. Larger culverts will have their invert buried to a depth of 500mm to simulate a natural stream bed. Heading up is undesirable in culverts and a clear head room of 300mm over the level of the 1 in 100 year design flow will be maintained. For minor water courses or drains that are normally dry in the absence of rainfall a minimum culvert dimension of 900mm will be used. For more substantial watercourses which are in constant flow a minimum clear opening dimension of 1,200mm is considered more appropriate. Concrete shall not be used to prevent erosion of stream beds and banks where a softer option is available.

6.1.1.5 Construction of Culverts

The proposed M28 Road Project will necessitate a number of culvert extensions and new culverts to be installed, 7 of which are required at water courses - 1 crossing of the Woodbrook Stream, 1 crossing the Donnybrook Stream and 5 crossings of the Glounatouig Tributary. The remaining culverts are located at interceptor ditches. Culverts have been designed in accordance with the requirements of the OPW, the statutory authority responsible for arterial drainage, IFI (2016) Guidelines and the NRA's DMRB. Drawings detailing the locations of the proposed culverts are included in **Appendix C**.

The proposed M28 Road Project has been designed and will be constructed in such a way as to ensure that the Woodbrook, Donnybrook and Glounatouig streams remain passable for fish where this is currently possible, and other aquatic fauna. This will be achieved by providing 'natural' rough substrates which will slow currents near the bottom of the culvert and create flow refuges enabling

invertebrates and juvenile fish to migrate upstream in otherwise impassable water velocities. All watercourse crossing works will be supervised by a suitably trained Ecological Clerk of Works.

For the culvert proposed on the Donnybrook stream at the Carr's Hill interchange, concerns expressed by IFI were taken on board and an alternative stream diversion and culvert designed. The stream will now be diverted at a right angle and then carried in open channel (newly constructed to fishery design specification) to the west of the proposed new carriageway.

The construction of the proposed culverts will be carried out in line with the guidelines and standards of TII and IFI.

At minimum, new culverts along the proposed road will achieve the following:

- The 1 in 100 year flood flow rate generated within the upstream catchment;
- An increase of 20% on the 1 in 100 year flood flow to allow for climate change effects;
- The culvert shall be capable of operating under the above conditions while maintaining a freeboard of at least 300 mm, and
- The proposed culverts have been designed in consultation with IFI to minimise any negative effect they may have the aquatic environment.

During the construction phase the Contractor shall ensure that:

- Instream works, where required, shall be undertaken during the period 1st May to 30th September as required by IFI to avoid accidental damage or siltation of spawning beds. This shall include preparatory work such as piling or rock blasting in the vicinity of all watercourses. Bank works shall not interfere with migrating fish from March to June and spawning fish migration from October to February;
- Where bank protection works may be required (i.e. upstream and downstream of new structures, to ensure no undercutting or destabilisation of either the structure or riparian bank areas occurs) large enough boulders shall be selected by the Contractor and strategically positioned, to ensure they cannot be undercut;
- If rock armour is required, the height to which this is built shall take account of the riparian zone, and if relevant, where protection of bird species is required. The Contractor shall adhere to IFI (2016) guidelines; and
- Bridge and culvert design has avoided impacting on flow regimes and river bed profiles upstream and downstream of the structure and has allowed for unimpeded movement of fish by ensuring a minimum depth of water within the structure. The Contractor shall ensure that flow regimes for all crossings identified as supporting salmonids, particularly Donnybrook and Glounatouig streams which exhibited best salmonid potential, shall allow for the unimpeded passage of fish upstream and downstream by having the invert buried 500m below bed level.

6.1.1.6 Stream Diversions

The existing watercourses will need to be modified by the construction of a number of new sections of open channel in order to interface with the drainage system and the alignment. There are 7 no. stream/spring diversions proposed, 3 no. of Donnybrook Stream, 2 no. of Woodbrook Stream, 1 no. at a land drain to the Glounatouig Stream. The 7th location is a diversion of Loughbeg Spring. Drawings detailing the locations of the proposed stream diversions are included in **Appendix C**.

Mitigation as per IFI (2016) guidelines was adhered to in the design of permanent and/or temporary stream diversions.

During construction, the Contractor shall ensure that:

- Permanent stream diversions within the Woodbrook, Donnybrook and Glounatouig streams will only be carried out in consultation with IFI;
- Detailed designs for realignments are submitted for approval to IFI, including the approach and departure channels to link back into the natural streams. This may include the need for bends and meanders to be incorporated, and if possible, the improvement of existing stream conditions if warranted (through river enhancement). The designs shall take into consideration the sinuosity and riffle ratio of the existing river and provide details of the substrate composition for the reconstructed channel. Realignments shall reflect the natural river systems in both plan and profile, and be compatible with the upstream and downstream sections of the existing channel. Landscaping along realigned sections of watercourse will aim to recreate riparian habitats using exclusively appropriate native species;
- Permanent stream diversions shall be completed as far in advance as possible. The channel will be constructed in such a way as to minimise suspended solids released when the river is rerouted, and to replicate existing upstream and downstream channel conditions as regards width, depth, gradient and instream material. These should also be sized to accommodate flood events;
- New stretches of watercourse on realignments shall be completed and have vegetation established prior to connecting to the original watercourse. Abandoned stretches shall be electro-fished by suitably qualified personnel (under licence) or by IFI (if agreed) to salvage fish stocks that were identified as occurring or having the potential to occur. If electrofishing is undertaken by IFI, they will be suitably reimbursed for the cost of fish removal and replacement;
- Temporary stream diversions within the Woodbrook, Donnybrook and Glounatouig streams will only be carried out in consultation with IFI;
- The diversions shall be excavated in isolation of stream flow e.g. through the use of coffer dams or other such techniques, starting from the bottom end of the diversion channel and working upstream to minimise sediment production. The temporary channel will be constructed in such a way as to minimise suspended solids being released when the river is re-routed. Upon completion, the river bank shall be stabilised around the temporary diversion;
- Silt curtains derived from terram or other similar material will be placed along the stream banks to avoid sedimentation to the channel. These would need to be checked on a regular basis with the heavy material removed from the first silt curtain thereby keeping it functional;
- Works will be carried out during low flow periods to minimise silt disturbance and during the specified timeframes allowed by IFI (1st May to 30th September);
- Temporary silt traps will be installed downstream of works;

- Riparian plants, trees and instream material(s) as necessary, will be transferred to the newly created channel and carried out under IFI's direct supervision;
- Gravels and stones removed from the dried out river channels will be securely stored for re-use in the newly created river channel;
- Once constructed, to allow the new channel to stand with water – which will give time for planted vegetation to become established before water flows through the diversion and this will, in turn, provide protection for new earthworks, and
- Newly constructed river and stream channels shall have banks battered to a finished angle of not greater than 45° on one bank and not greater than 30° on the opposite banks, (to allow for maintenance of a low flow channel, and overflow and a flood flow channel). Banks shall be top soiled and seeded so as to ensure the growth and development of a broad range of local grasses and shrubs thereby facilitating development of stable bank root structures. Broadleaves shall, where prescribed by IFI, be planted along newly created channel so as to provide a mixture of dapple and shade conditions. Planting shall be a minimum of 5m from the watercourse channel.

There shall be maintenance of good site management at all times and all site personnel will be made aware of the importance of the freshwater environment and the requirement to avoid pollution of all types, throughout all stages of the construction phase of the proposed M28 Road Project.

6.1.1.7 Environmental Incidents and Accidents

- An emergency-operating plan shall be established to deal with incidents or accidents during construction that may give rise to pollution within any watercourse. This shall 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 shall 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 shall be no discharge of un-attenuated water to the adjacent marine environment.

6.1.1.8 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 shall be designed and laid out to minimise exposure to wind.

6.1.1.9 Invasive Species Measures

Five non-native invasive species, traveller's joy, cherry laurel, Japanese knotweed, butterfly bush and three cornered garlic were recorded within the road footprint and immediate surrounds. The presence of non-native invasive species within the study area provides the potential for the spread of these species by the proposed works. These species are highly invasive and out-compete native flora to form single species stands. In the case of Japanese knotweed, its presence along watercourses is particularly significant, as contaminated soil or vegetative material washed from an infected area can result in the spread of this species downstream. Appropriate mitigation measures including management and control measures are required at all sites within the proposed works area where this species is encountered for the prevention of spread of these species. The following guidelines will be followed in relation to non-native invasive plant species:

- *Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads* (NRA, 2010),
- *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 has been prepared for this project (**EIS Appendix C Volume 4**) and shall be implemented prior to and during construction works.

6.1.1.10 Timing of Instream Works

There are significant variations in the timing and duration of salmonid (salmon and trout) spawning activity throughout the Republic of Ireland (IFI, 2016). To minimise adverse impacts on the fisheries resource, instream works will be carried out between 1st May and 30th September. Given the presence of brown trout in the Donnybrook and Glounatouig streams, consultation will be undertaken with IFI prior to the scheduling of instream works including all culvert design and installation and temporary and permanent stream diversions.

6.1.1.11 Flooding

The creation of impermeable areas may alter flow patterns in the immediate vicinity of the construction areas and compounds potentially leading to localised surface water ponding. Flooding of the proposed project footprint during the construction stage may result in pollution of Cork Harbour due to materials and substances entering receiving watercourse following a flood event.

In order to avoid causing flooding during the construction phase all existing surface water drainage and discharge points will be maintained. A surface water drainage system to manage surface water run-off and dewatering requirements will be provided to reduce the potential risk of flooding.

In order to avoid materials and substances entering Cork Harbour as a result of flooding, the working platform within the Service Area site will be above a level of 3.30 m OD for the duration of the works. Dewatering of excavations will be treated prior to any discharge to Cork Harbour.

6.1.1.12 Impact to Aquifer Vulnerability

Areas where groundwater vulnerability is Extreme will require protection from surface water run-off and will include mitigation measures such as those outlined below, which will follow the guidelines set out in the following publications; Drainage Design for National Road Schemes - Sustainable Drainage Options, NRA (2014) and Method C – Groundwater Protection Response (GWPR) for the Use of Permeable Drain Systems on Road Schemes as detailed in the TII Publication - Road Drainage and the Water Environment, DN-DNG-03065.

The Groundwater Protection Response (GWPR) assessment was carried out as follows:

- Step 1: Calculation of the site specific vulnerability based on information taken from Site Investigation (SI) data i.e. the thickness and type of overburden material encountered.
- Step 2: Determination of the aquifer classification e.g. Lk or Ll.
- Step 3: Determination of groundwater level from SI data.
- Step 4: Identification of areas of karst and receptors such as public wells.
- Step 5: Selection of an appropriate response classification from the GWPR matrix.
- Step 6: Establish if permeable drainage is suitable and/or if mitigation is required based on the response classification.

Following application of the GWPR Matrix for the use of permeable drains in road schemes, the following conclusion were arrived at (see **Table 6.1**, below):

Groundwater protection response R4 applies for the area of cut between Ch. 7,340 to Ch. 7,470 at Raffeen Quarry. Vulnerability here (Ch.7,340 - Ch.7,825) is classified as X (with rock at or near the surface or karst) and the Aquifer Classification is Lk, which equates to Rk, for the purposes of applying the matrix. Response classification R4 states that a permeable drainage system in this area is not acceptable.

Between Ch. 12,020 to Ch. 12,450 the proposed M28 Road Project will require significant cutting into the hillside. In the absence of 1m of unsaturated clay or 2m of unsaturated silt, sand or gravel, the GWPR matrix requires the drainage system to have a minimum consistent unsaturated thickness of 1m of 'appropriate material' either natural or man-made beneath the invert level of the point of discharge.

In the area of Extreme vulnerability (Ch. 4,880 to Ch. 5,920) at the major cut at Shannonpark (Ch. 4,640 to Ch. 5,920), the groundwater protection response matrix when applied yields response classification R2(2). In this area a permeable drainage system is acceptable as the requirements, as set out in the GWPR, meet the minimum design standards of the TII .i.e. a minimum thickness of 1m

unsaturated subsoil classed as clay or 2m of unsaturated subsoil classed as sand, gravel or silt. However, where the protective overburden material may be removed and the base of the cutting may be below the existing groundwater table (between Ch. 5,240 to Ch. 5,920 where groundwater was encountered at 2mbgl and 3mbgl), a closed drainage system is provided in the design.

In the cuttings between Ch. 7,340 to Ch. 7,470 where permeable drainage is not acceptable and in other cuttings where the protective overburden material may be removed and the base of the cutting may be below the existing groundwater table, a closed drainage system is provided in the design. This permits free drainage of sections in cutting and the road surface without allowing the run-off to percolate into the groundwater, thus eliminating a potential pollution hazard.

The geotechnical assessment indicated the need for drainage measures for cuttings in the glacial till such as side slope drains or drainage blanket. The drainage system for the alignment will consist of edge drainage of the carriageway and link roads, cut-off/interceptor drains at the head of cuttings and at the toe of embankments, outfall channels/pipes and attenuation facilities where required. While the primary purpose of the attenuation ponds is to reduce flood risk they will also contribute to improved water quality by facilitating settling and detention of sediments and contaminants carried through the pipe network from the carriageway.

Groundwater vulnerability is classified as Extreme at the Service Area therefore where the protective overburden material is removed and the base of the cutting may be below the existing groundwater table, a closed drainage system will be adopted which will pass through a hydrocarbon separator before being discharged to the main surface water drainage system. The treatment or removal of potentially contaminated material will have a positive impact on the hydrogeological environment by removing a potential source of contamination.

Table 6.1: Groundwater Protection Response Matrix for the use of permeable drains in road schemes (TII Publication, DN-DNG-03065)

Vulnerability rating	Source protection area	Resource protection area (aquifer category)							
		Regionally Important Aquifer			Locally Important Aquifer			Poor aquifer	
		Rk*	Rf	Rg	Lg	Lm	Ll	Pl	Pu
Extreme: Rock near Surface or karst (X)	R4	R4	R4	R3(2)	R3(2)	R3(1)	R3(1)	R3(1)	R3(1)
Extreme (E)	R4	R2(3)	R2(2)	R3(2)	R3(2)	R2(2)	R2(2)	R2(1)	R2(1)
High (H)	R3(2)	R2(2)	R2(2)	R2(2)	R2(2)	R2(2)	R2(2)	R2(1)	R2(1)
Moderate (M)	R3(1)	R2(1)	R2(1)			R2(1)	R2(1)	R1	R1
Low (L)	R3(1)	R1	R1			R1	R1	R1	R1

* A small proportion of the country (~0.6%) is underlain by locally important karstic aquifers (Lk); in these areas, the groundwater protection responses for the Rk groundwater protection zone shall apply.

6.1.1.13 Encountering of Karst Features

Potential karst features were previously identified during the geophysical investigations carried out by Apex Geoservices in 2006. A swallow hole at Shanbally was discovered in 2010. No further karst features were identified during the 2014 site investigation works. The potential for encountering unknown karst features has been taken into account by the geotechnical team as they represent a potential risk of collapse during both the construction stage and the operational stage.

Karst features will require protection from surface water run-off and will include mitigation measures as set out below and in accordance with the guidelines in the following publications:

Drainage Design for National Road Schemes - Sustainable Drainage Options, NRA (2014) and Method C – Groundwater Protection Response (GWPR) for the Use of Permeable Drain Systems on Road Schemes as detailed in the TII Publication - *Road Drainage and the Water Environment*, DN-DNG-03065.

- The GWPR Matrix requires that in aquifers classified as Lk or Rk, particular attention is to be made to the presence of karst features; drainage shall be 15m away from such features and particular attention must be made to the possibility of instability.
- The lining of attenuation ponds with a suitable membrane, where there is less than 1.5m of low permeability soils beneath the base of the pond and the top of the groundwater table.
- Where rockhead is exposed during construction any fissures or cavities encountered will be cleaned of loose soils and backfilled with granular fill material in order to maintain the flow path to rock and to support the road pavement.
- Where an embankment is to be created, the placing of a geotextile at the base to prevent sudden, catastrophic failures. This geotextile is intended to span any potential voids that could develop in an area of cutting. It is practice to “proof-roll” the area; this involves traversing the area with a large vibratory roller and checking for any localised collapse of the ground.

6.1.2 Operational Phase

6.1.2.1 Surface Water Drainage Design

Run-off from the existing N28 is primarily over embankments to fields which eventually discharge to existing watercourses. As part of the proposed project, it is proposed to control and attenuate water draining the M28 Road Project during the project’s operational phase. The drainage design will facilitate attenuation 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 project zone of influence. All receiving watercourses and coastal tidal areas form connectivity with or are located within Cork Harbour SPA and by extension form remote connectivity with the Great Island Channel SAC. One of the principal elements of the drainage design requirements is the consideration of pollution and flood risk requirements. Surface water drainage design measures for the scheme are illustrated in **Appendix C**.

Measures to attenuate and treat carriageway run-off have been incorporated into the drainage design of the proposed M28 Road Project in accordance with TII standards. The proposed M28 Road Project involves the construction of a new surface water drainage system for the proposed road including new outfalls to existing watercourses or existing surface water drainage networks. Furthermore, the proposed road project will cross a number of local watercourses, necessitating stream realignments, new culvert crossings and extensions to existing culverts. The stream diversions, culverts, surface water drainage network, and catchment run-off interceptors have been designed so as to minimise the potential impact on the receiving watercourses.

Attenuation measures in the form of attenuation tanks/ ponds and grassed swales are proposed to reduce the rate of run-off discharged to the receiving watercourses.

In order to minimise the risk of overloading the receiving streams/ rivers and existing surface water drainage networks, it is proposed to limit the rate at which flow is discharged from the attenuation tanks and ponds to the ‘greenfield’ or pre-development run-off rate from that catchment area.

While the primary purpose of the attenuation ponds, tank and swales is to reduce the risk of flooding in the receiving watercourse/ networks, they will also contribute to improved water quality by facilitating settlement and deposition of sediment and contaminants carried through the pipe network from the carriageway.

The surface water drainage network will discharge run-off from the mainline of the road to ground, watercourses, existing surface water drainage networks or onto the foreshore. A total of 13 outfall locations are proposed for the mainline road drainage.

Where no surface water course or existing drainage network is available, it is proposed to provide soakaways which will discharge run-off to ground.

The proposed surface water drainage system includes measures to reduce the concentrations of pollutants that are routinely found in road 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 hydrocarbon interceptor will be provided upstream of each proposed outfall.

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 reduced to an acceptable level, the following which have been incorporated within the surface water drainage network, will contribute to the treatment of surface water run-off from the proposed M28 Road Project:

- Filter Drains,
- Grassed Swales,
- Infiltration Trenches,
- Retention Ponds, and
- Class I forecourt interceptor and Class I By-Pass Separator at the Service Area.

The drainage design for the proposed road project will include provision of three outfalls discharging to the coastal environment. None of these outfalls will be located within lands designated as part of Cork Harbour SPA. There shall be no discharge of un-attenuated water to the adjacent marine environment and those areas designated as part of Cork Harbour SPA.

Surface water drainage design measures for the scheme are illustrated in **Appendix C**.

6.1.2.2 Aquifer Vulnerability

Mitigation measures include the provision of closed drainage systems for areas of X (rock at or near surface) or E (Extreme) aquifer vulnerability in areas of cut. As aquifer vulnerability is either Extreme or High, the discharge of surface water run-off will be controlled in order to prevent the pollution of groundwater. In the section of road adjacent to Loughbeg at Barnahely there will be a hydrocarbon separator to protect groundwater in the area from contamination and an attenuation pond which will improve the quality of the water being drained to Loughbeg Spring to meet specific water quality standards such as the European Communities Environmental Objectives (Surface Water)

Regulations, 2009 (S.I. No. 272 of 2009). The use of SuDS pre-treatment will remove pollutants, suspended solids and silt in order to prevent contamination of the surface water and groundwater as a result of run-off.

6.1.2.3 Environmental Incidents and Accidents

Within the Service Area, the proposed surface water drainage network is separated into two networks; one serving fuel filling and storage areas and one serving hard-standing and parking areas.

The risk of contamination in the fuel filling and storage areas is significantly greater, therefore run-off from these areas will be treated by a Class I forecourt separator. A forecourt separator is designed to ensure that flow cannot exit the unit without first passing through the coalescer assembly. In normal operation conditions, the forecourt separator has sufficient capacity to provide storage for separated pollutants within the main chamber. In the event of an accidental spillage from a fuel delivery tanker compartment on the forecourt, this type of separator is capable of storing up to 7,600 litres of pollutants.

Forecourt separators are designed to ensure that oil and other hydrocarbons cannot exit the separator in the event of an accidental spillage. In the event of an accidental spillage, the separator must be emptied and materials disposed of at a suitable facility.

The risk of contamination in non fuel filling and parking areas is lower than fuel filling and storage areas therefore run-off from such areas will be treated by a Class I By-Pass separator prior to discharge. By-pass separators are designed to treat 10% of the peak flow rate. Flows generated by higher rainfall rates will pass through part of the unit and will bypass the main separation chamber.

Class I separators (both by-pass and forecourt) are designed to achieve a concentration of 5 mg/litre of oil.

7 ANALYSIS AND CONCLUSIONS

7.1 INTEGRITY OF THE EUROPEAN SITE

From the 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 (EC, 2002), the meaning of integrity is described as follows;

'The integrity of a site involves its ecological functions. The decision as to whether it is adversely affected should focus on and be limited to the site's conservation objectives' (MN2000, paragraph 4.6(3))'.

7.2 INTEGRITY OF CORK HARBOUR SPA

Site specific Conservation Objectives were published for Cork Harbour SPA in December 2014. This document provides specific attributes and targets by which the maintenance of favourable conservation condition of qualifying interests within Cork Harbour SPA are measured Site specific Conservation Interests for Great Island Channel SAC. The overarching conservation objective for the European sites is as follows:

Objective: To maintain or restore the favourable conservation condition of the Special Conservation Interests for which the SPA has been selected (see **Section 3**).

Potential exists for impacts to the SCIs Cork Harbour SPA during the construction and operation phase of the proposed M28 Road Project; however these can be readily mitigated through the implementation of mitigation as outlined in **Section 6**.

From the information gathered and the predictions made about the changes that are likely to result from the construction and operation stages of the project and the mitigation measures proposed to avoid impacts to the SPA, the integrity of site checklist is completed for Cork Harbour SPA in **Table 7.1** below.

Table 7.1: Integrity of Site Checklist for Cork Harbour SPA

Conservation Objectives		
Does the project have the potential to:	Yes or No	Comment
Cause delays in progress towards achieving the conservation objectives of the site?	No	Potential impacts affecting Cork Harbour SPA will be avoided and will not cause delays in achieving the conservation objectives of the site. Required mitigation measures are outlined in Section 6 .
Interrupt progress towards achieving the conservation objectives of the site?	No	Potential impacts affecting Cork Harbour SPA will be avoided and will not cause delays in achieving the conservation objectives of the site. Required mitigation measures are outlined in Section 6 .
Disrupt those factors that help to maintain the favourable	No	Factors potentially disrupting the favourable conservation conditions of the site will be restricted through the implementation of mitigation measures. Required

Conservation Objectives		
Does the project have the potential to:	Yes or No	Comment
conditions of the site?		mitigation measures are outlined in Section 6 .
Interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site?	No	Potential impacts affecting Cork Harbour SPA such as the deterioration of water quality within receiving watercourses and waterbodies will be minimised through the application of mitigation. Required mitigation measures are outlined in Section 6 .
Other Indicators		
Does the project or plan have the potential to:		
Cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a habitat or ecosystem?	No	Potential impacts may occur through pollution of watercourses and receiving waterbodies during the construction and operational phases. However these impacts can be effectively mitigated. Required mitigation measures are outlined in Section 6 .
Change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?	No	Potential impacts may occur through pollution of watercourses and receiving waterbodies during the construction and operational phases. However these impacts can be effectively mitigated. Required mitigation measures are outlined in Section 6 .
Interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	No	Potential impacts may occur through pollution of watercourses during the construction phase. However these impacts can be effectively mitigated. Required mitigation measures are outlined in Section 6 .
Reduce the area of key habitats?	No	There will be no direct loss of key habitats associated with Cork Harbour SPA. However, potential indirect impacts may occur through pollution of watercourses during the construction and operational phase. However these impacts can be effectively mitigated. Required mitigation measures are outlined in Section 6 .
Reduce the population of key species?	No	It is considered that there will be no direct impacts to the SCI species for Cork Harbour SPA during the project's construction or operational phase. Indirect impacts may occur due to the deterioration of water quality in receiving watercourses and waterbodies during the project's construction and operational phases. However these impacts can be effectively mitigated. Required mitigation measures are outlined in Section 6 .
Change the balance between key species?	No	It is considered that there will be no direct impacts to the SCI species for Cork Harbour SPA during the construction or operational phase of the project. Indirect impacts may occur due to the deterioration of water quality in receiving watercourses and waterbodies during the project's construction and operational phases. However these impacts can be effectively mitigated. Required mitigation measures are outlined in Section 6 .
Reduce diversity of the site?	No	It is considered that there will be no direct impacts on the SCI species for Cork Harbour SPA during the construction or operational phase of the project. Indirect impacts may occur due to the deterioration of water quality in receiving

Conservation Objectives		
Does the project have the potential to:	Yes or No	Comment
		watercourses and waterbodies during the project's construction and operational phases. However these impacts can be effectively mitigated. Required mitigation measures are outlined in Section 6 .
Result in disturbance that could affect population size or density or the balance between key species?	No	Avifaunal species using areas designated as part of Cork Harbour SPA will not be disturbed, directly or indirectly by the proposed M28 Road Project. Potential disturbance impacts may affect small numbers of intermittently occurring over-wintering avifauna using improved pastoral fields north of Lough Beg, outside of the SPA boundary. Over-wintering avifaunal surveys of this area in 2014/15 and 2015/16 confirmed that SCI species for Cork Harbour SPA use this area sporadically and in low numbers. Potential disturbance events are associated with species using expansive pastoral fields following extensive rainfall periods or at high tide. However, should the disturbance or displacement of these birds occur, there is sufficient area of improved grassland habitats that afford similar field feeding opportunities for these species. Disturbance events are considered to affect small numbers of intermittently occurring species. These disturbance events are not considered significant in terms of Cork Harbour SPA.
Result in fragmentation?	No	The proposed M28 Road Project will not result in the fragmentation of areas designated as part of Cork Harbour SPA. There will be some fragmentation of undesignated pastoral lands used intermittently as field feeding habitat to the north of Lough Beg. However, such fragmentation effects are not considered to be significant in the context of Cork Harbour SPA.
Result in loss or reduction of key features (e.g. tree cover, tidal exposure, annual flooding, etc.)?	No	No key features of Cork Harbour SPA, such as intertidal habitats, key feeding or roosting sites will be lost as a result of construction or operation of the proposed M28 Road Project.

7.3 INTEGRITY OF GREAT ISLAND SAC

Site specific conservation objectives were published in June 2014 for Great Island Channel SAC (NPWS, 2014b). This document provides specific attributes and targets by which the maintenance of favourable conservation condition of qualifying interests within Great Island Channel SAC is measured. The overarching conservation objective for the European sites is as follows:

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected (see **Section 3**).

Potential exists for impacts to the QIs of Great Island SAC during the construction and operation phase of the proposed M28 Road Project; however these can be readily mitigated through the implementation of mitigation as outlined in **Section 6**.

From the information gathered and the predictions made about the changes that are likely to result from the construction and operation stages of the project and the mitigation measures proposed to avoid impacts to the SAC, the integrity of site checklist is completed for Great Island SAC in **Table 7.2** below.

Table 7.2: Integrity of Site Checklist for Great Island SAC

Conservation Objectives		
Does the project have the potential to:	Yes or No	Comment
Cause delays in progress towards achieving the conservation objectives of the site?	No	The proposed M28 Road Project will not cause delays in achieving the conservation objectives of the site. Potential impacts in the form of water quality deterioration to Cork Harbour and by extension Great Island Channel SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Interrupt progress towards achieving the conservation objectives of the site?	No	The proposed M28 Road Project will not interrupt progress towards achieving the conservation objectives of the site. Potential impacts in the form of water quality deterioration to Cork Harbour and by extension Great Island Channel SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Disrupt those factors that help to maintain the favourable conditions of the site?	No	The proposed M28 Road Project will not disrupt those factors that help to maintain the favourable conditions of the site. Potential impacts in the form of water quality deterioration to Cork Harbour and by extension Great Island Channel SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site?	No	The proposed M28 Road Project will not interfere with the balance, distribution and density of key species that are the indicators of the favourable condition of the site. Potential impacts in the form of water quality deterioration to Cork Harbour and by extension Great Island Channel SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Other Indicators		
Does the project or plan have the potential to:		
Cause changes to the vital defining aspects (e.g. nutrient balance) that determine how the site functions as a habitat or ecosystem?	No	Potential impacts in the form of water quality deterioration to Cork Harbour and by extension Great Island Channel SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Change the dynamics of the relationships (between, for example, soil and water or plants and animals) that define the structure and/or function of the site?	No	Potential impacts in the form of water quality deterioration to Cork Harbour and by extension Great Island Channel SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Interfere with predicted or expected natural changes to the site (such as water dynamics or chemical composition)?	No	Potential impacts may occur through pollution of receiving watercourses and Cork Harbour during the construction and operational phases of the scheme. This could impact on Annex I habitats associated with Great Island Channel SAC but can be readily mitigated. Required mitigation measures

Conservation Objectives		
Does the project have the potential to:	Yes or No	Comment
		are outlined in Section 9.
Reduce the area of key habitats?	No	There will be no direct loss of key habitats within the Great Island Channel SAC. However, potential indirect impacts may occur through pollution of watercourses during the construction and operational phases but can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Reduce the population of key species?	No	There will be no direct reduction of key species within the Great Island Channel SAC. However, potential indirect impacts may occur through pollution of watercourses during the construction and operational phases but can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Change the balance between key species?	No	The proposed M28 Road Project will be not change the balance between key species associated with the Great Island Channel SAC. Mitigation measures are prescribed to safeguard the scheme's receiving waters and the waters of Cork Harbour. Required mitigation measures are outlined in Section 6 .
Reduce diversity of the site?	No	The proposed M28 Road Project will not reduce the diversity of the Great Island Channel. Potential impacts through the deterioration of water quality in Cork Harbour and by extension, the Great Island Channel SAC can be readily mitigated. Required mitigation measures are outlined in Section 6 .
Result in disturbance that could affect population size or density or the balance between key species?	No	No impacts have been identified that would result in disturbance that could affect population size or density or balance between key species associated with Great Island Channel SAC.
Result in fragmentation?	No	No impacts have been identified that would result in fragmentation of habitats for which the Great Island Channel SAC has been designated.
Result in loss or reduction of key features (e.g. tree cover, tidal exposure, annual flooding, etc.)?	No	No key features associated with the Great Island Channel SAC will be lost as a result of construction or operation of the proposed development.

7.4 CONCLUSIONS

This NIS for the proposed M28 Road Project has been carried out in accordance with Article 6 (3) of the 'Habitats' Directive 92/43/EEC. This Statement provides a professional scientific examination of the project and the relevant European sites, identifying and characterising any possible implications for the European site in view of the conservation objectives, taking account of in-combination effects.

In spite of its proximity to Cork Harbour SPA, the proposed M28 Road Project will not impact the qualifying interests or the SCI species for this European site. Avifaunal surveys of the scheme and its environs indicate that the footprint of the proposed development supports intermittent occurrences

of over-wintering SCI species for Cork Harbour SPA, such as Curlew. Over-wintering avifauna utilise these sections of the scheme for field feeding purposes. However, occurrences of over-wintering avifauna in these areas are intermittent and numbers using these fields are not significant in the context of over-wintering avifaunal populations for Cork Harbour SPA. Feeding avifauna displaced by the proposed road project will be able to relocate to proximal improved grassland habitats that offer similar field feeding opportunities, such as ground suitability, prey abundance, sightlines etc. As a result, the displacement of intermittently occurring Curlew within these fields is not considered significant in terms of the over-wintering population associated with Cork Harbour SPA.

Robust and effective best practice guidance measures have been proposed for the avoidance of any impacts affecting potential impacts to European sites within the development ZOI. The implementation of best practice construction measures will restrict the release of potential deleterious substances from reaching receiving watercourses which support connectivity to Cork Harbour SPA and Great Island Channel SAC.

The conclusion of this NIS is that with the implementation of best practice and the recommended mitigation measures there will be no potential for direct, indirect or cumulative impacts arising from the proposed M28 Road Project in combination with any other plans or projects. The integrity of Cork Harbour SPA or the Great Island Channel SAC will not be adversely affected. No reasonable scientific doubt remains as to the absence of such adverse effects.

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APPENDIX A

M28 CORK TO RINGASKIDDY ROAD PROJECT – SCREENING FOR APPROPRIATE ASSESSMENT



M28 Cork to Ringaskiddy Project

Screening for Appropriate Assessment Report

Document Control Sheet

Client:	Cork County Council		
Project Title:	M28 Cork to Ringaskiddy Project		
Document Title:	M28 Cork to Ringaskiddy Project – Screening for Appropriate Assessment Report		
Document No:	MCT0597RP0013_F01		
Text Pages:	43	Appendices:	1

Rev.	Status	Date	Author(s)		Reviewed By		Approved By	
F01	Final	10 th May 2017	CH	<i>Ch Headip</i>	ED	<i>Ed O'Brien</i>	PK	<i>Paul Keenan</i>

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1 INTRODUCTION

RPS were commissioned by Cork County Council (CCC) to bring to completion the proposed M28 Cork to Ringaskiddy Project (referred to hereafter as the proposed M28 Road Project) in line with Phases 1 to 4 of the NRA Project Management Guidelines (January, 2010) as follows;

- Phase 1 – Scheme Concept and Feasibility;
- Phase 2 – Route Selection;
- Phase 3 – Design; and
- Phase 4 – EIA/EIR & the Statutory Procedure [including Appropriate Assessment process].

CCC proposes to upgrade the existing N28 carriageway from the Bloomfield Interchange at the tie-in with the N40 South Ring Road, to Carr's Hill south of Douglas. Thereafter, it is proposed to construct a new section of motorway, approximately 8.9km in length, terminating at Barnahely. From Barnahely to east of Ringaskiddy village, a single-carriageway cross-section is to be provided (approximately 1.5km in length). The overall length of the proposed M28 Road Project is approximately 12.4km (road project extent displayed **Error! Reference source not found.** it is also proposed to construct a new service area for the proposed M28 Road Project immediately north-east of Ringaskiddy (See **Figure 1.2**).

A route selection report has been prepared under Phase 2 of the NRA Project Management Guidelines as referenced above and a preferred route has been identified.

1.1 LEGISLATIVE CONTEXT – HABITATS DIRECTIVE

Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora, better known as “The Habitats Directive”, provides legal protection for habitats and species of European importance. Articles 3 to 9 provide the legislative means to protect habitats and species of European Community interest through the establishment and conservation of an EU-wide network of sites known as Natura 2000.

Natura 2000 sites are defined under the Habitats Directive (Article 3) as a coherent European ecological network of special areas of conservation, composed of sites hosting the natural habitat types listed in Annex I and habitats of the species listed in Annex II, shall enable the natural habitat types and the species' habitats concerned to be maintained or, where appropriate, restored at a favourable conservation status in their natural range. In Ireland, these sites are designated as European sites and include Special Protection Areas (SPAs), established under the EU Birds Directive (79/409/EEC, as codified by 2009/147/EC) for birds and Special Areas of Conservation (SACs), established under the Habitats Directive 92/43/EEC for habitats and species.

Articles 6(3) and 6(4) of the Habitats Directive set out the decision-making tests for plans and projects likely to affect Natura 2000 sites (Annex 1.1). Article 6(3) establishes the requirement for Appropriate Assessment of Natura 2000 sites, (abbreviated AA):

Article 6(3) states:

Any plan or project not directly connected with or necessary to the management of the [Natura 2000] site but likely to have a significant effect thereon, either individually or in

combination with other plans or projects, shall be subject 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 [Natura 2000] 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.

Where the site concerned hosts a priority natural habitat type and/or a priority species the only considerations which may be raised are those relating to: human health or public safety; beneficial consequences of primary importance for the environment; or, further to an opinion from the Commission, other imperative reasons of overriding public interest.

This screening report comprises the information for the public authority under Regulation 42(2) of the Birds and Natural Habitats Regulations 2011, as amended, to examine the likely significant effects of the proposal, individually or in combination with other plans or projects, on European sites in light of the specific Conservation Objectives (COs) of the Qualifying Interests (QIs) of SACs and Special Conservation Interests (SCI) of SPAs.

1.2 STUDY AREA

The N28 is a national primary road which links Cork City to Ringaskiddy (**Error! Reference source not found.**). The N28 runs southwards from the N40 Cork South Ring Road, passing between the suburban areas of Douglas and Rochestown. At the Shannonpark area, just north of the market town and commuter settlement of Carrigaline, the roadway turns eastward, forming the major access to the Ringaskiddy peninsula. The N28 road is approximately 13km long and is a single carriageway road except for a dual section at the approach to the Bloomfield Interchange (the junction with the Cork South Ring Road, N40).

Several major commercial industries are located in the Ringaskiddy area, together with a deep-water port for Cork, a "roll-on roll-off" ferry terminal and the headquarters of the Irish Naval Services.



Figure 1.1 – Proposed M28 Road Project Location



Figure 1.2 – Proposed Service area at Ringaskiddy

1.3 PROJECT DESCRIPTION

The proposed M28 Road Project will consist of the construction, operation and maintenance of 10.9 kilometres of dual carriageway motorway from the N40 Bloomfield Interchange to Barnahely, 1.5 kilometres of single carriageway protected¹ road from Barnahely to the eastern side of Ringaskiddy and a service area at the Port of Cork facility at Ringaskiddy together with ancillary and consequential works.

An overview is shown on **Figure 1.1** and comprises;

- 10.9km of mainline motorway from Bloomfield to Barnahely;
- 1.5km of mainline single carriageway protected road from Barnahely to east of Ringaskiddy;
- 4.8km of new and realigned regional and local roads;
- 2.2km of accommodation works tracks;
- 1 full grade-separated interchange at Carr's Hill with associated roundabouts, slip roads and widening of the existing underbridge at Carr's Hill;
- 3 partial grade-separated interchanges at Bloomfield/Rochestown Road, Shannonpark and Shanbally, with associated roundabouts and slip roads, including 2 new underbridges, existing bridge at Rochestown retained as part of the scheme;
- 3 at-grade roundabouts at Barnahely, Loughbeg and eastern Port of Cork entrance;
- Provision of a M28 to N40 westbound link road and improvement of the westbound merge from the M28 to the N40;
- Removal of the existing sub-standard northbound on-ramp at Maryborough Hill;
- Upgrading of the existing sub-standard off-ramp to Mount Oval;
- 4 new road underbridges to allow the proposed M28 to pass over existing roads;
- 1 underbridge widening at Carr's Hill;
- 2 shared use pedestrian and cyclist underpasses, one at Carr's Hill and one at Old Post Office Road;
- Demolition of the existing Maryborough Hill overbridge and construction of a replacement overbridge at the same location. This overbridge will take Maryborough Hill over the widened M28 below;
- Various other structures including large retaining walls and stream culverts;
- Traffic signalised control to be implemented at key junctions on Rochestown Road, including the replacement of the Rochestown Road roundabout with a signalised junction, signalling of the merge to the M28 and signalling of the Clarke's Hill junction;
- Local road improvements and parallel access roads, etc;
- Accommodation works and farm accesses as required;
- Provision for footpaths and cycle facilities;
- Relocation of high voltage electricity pylons at Shanbally;
- Drainage system, including attenuated outfalls, watercourse culverts and realignments;
- Landscaping and environmental mitigation measures; and
- A Service Area for commercial vehicles including amenity building, fuel facilities, parking etc. within the Port of Cork lands at Ringaskiddy.

¹No access points other than designated junctions will be permitted to this road.

The need for the Proposed M28 Road Project derives from the requirements of European and National Transportation and Port Access policies and is strongly underpinned in national, regional and local planning policy.

The detailed desktop assessment conducted as part of this Screening for AA included the interrogation of the all available data sets, including the NPWS protected species and habitats datasets (including mapping and site specific data searches), for European sites to determine a Zone of Influence (Zoi) from the proposed M28 Road Project. Determination of this project's Zone of Influence (Zoi) was achieved by assessing the project's requirements and deliverables against the ecological receptors within the project footprint, in addition to all ecological receptors that could be connected to and subsequently impacted by the project through abiotic and biotic vectors. To this end, the zone of influence extends outside of the proposed road project footprint to include ecological receptors connected to the project through overlap / intersection, proximity and connectivity through features such as watercourses.

The elements proposed that comprise the proposed works were used to establish sites likely to be impacted within the Zoi during the construction and operational phases of the proposed works. The European sites situated within the Zoi of the proposed M28 Road Project are illustrated in **Figure 3.1**.

The study area supports connectivity to Cork Harbour SPA at the Douglas River Estuary via two watercourses; i.e. Woodbrook and Donnybrook stream and Cork Harbour SPA at Monkstown Creek via the Glounatouig stream. The proposed route is located in close proximity to Cork Harbour SPA and supports remote connectivity to Great Island Channel SAC via Cork Harbour.

The proposed service area is located immediately north-east of Ringaskiddy in an area of made ground, currently utilised for car parking. This area is located 1.3km south-east of Monkstown Creek, the most proximal segment of Cork Harbour SPA.

The European sites which support connectivity with the proposed road improvement works are as follows:

- Great Island Channel SAC; and
- Cork Harbour SPA.

This project does not support connectivity with any other European sites.

2 METHODOLOGY

2.1 STAGES OF THE APPROPRIATE ASSESSMENT

The Department of the Environment Heritage and Local Government guidelines (DoEHLG, 2010) outlines the European Commission's methodological guidance (EC, 2002) promoting a four-stage process to complete the AA, and outlines the issues and tests at each stage. An important aspect of the process is that the outcome at each successive stage determines whether a further stage in the process is required.

The four stages are summarised diagrammatically in **Figure 2.1** below, and an outline of the steps and procedures involved in completing each stage follows. Stages 1-2 deal with the main requirements for assessment under Article 6(3). Stage 3 may be part of the Article 6(3) Assessment or may be a necessary precursor to Stage 4. Stage 4 is the main derogation step of Article 6(4).

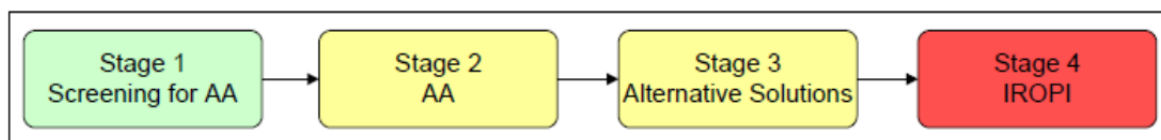


Figure 2.1 – Figure Stages of Appropriate Assessment

In complying with the obligations under Article 6(3) and following the EC2000 and MN2000 Guidelines, this AA has been structured as a stage by stage approach as follows:

Stage 1 - Screening for AA

- Description of the project,
- Identification of European sites potentially affected,
- Identification and description of individual and cumulative impacts likely to result,
- Assessment of the significance of the impacts identified above on site integrity,
- Exclusion of sites where it can be objectively concluded that there will be no significant effects, and
- Screening conclusion.

If the effects are deemed to be significant, potentially significant, or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2 (AA). This report fulfils the information necessary to enable the competent authority to screen the proposal for the requirement for Appropriate Assessment.

This report forms Stage 1 of the AA process and sets out the following information:

- Description of the proposed M28 Road Project and service area,
- Characteristics of the proximal European sites, and
- Assessment of significance of the proposed works on the European sites in question.

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 and legislation:

- DoEHLG (2009, rev. 2010) *Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities*. Department of the Environment, Heritage and Local Government,
- European Communities (2000) *Managing European Sites: the provisions of Article 6 of the 'Habitats' Directive 92/43/EEC*, Office for Official Publications of the European Communities, Luxembourg. European Commission;
- European Commission (EC) (2002) *Assessment of Plans and Projects Significantly Affecting European 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. European Commission;
- EC (2007) *Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EEC – Clarification of the concepts of: alternative solutions, imperative reasons of overriding public interest, compensatory measures, overall coherence, opinion of the commission*. European Commission;
- EC (2013) *Interpretation Manual of European Union Habitats*. Version EUR 28. European Commission;
- The European Union (Environmental Impact Assessment and Habitats) Regulations 2011;
- The European Communities (Birds and Natural Habitats) Regulations 2011, as amended; and
- The Planning and Development Act 2000-2015.

2.2 SCREENING PROTOCOL

The sequence of events when completing the AA Screening process is provided below.

2.2.1 Screening Sequence

- Definition of the Zol for the proposed works;
- Identification of the European sites that are situated (in their entirety or partially or downstream) within the Zol of the proposed works;
- Identification of the most up-to-date Qualifying Interests (QIs) for each European site occurring either wholly or partially or downstream within the Zol;
- Identification of the environmental conditions that maintain the QIs at the desired target of Favourable Conservation Status;
- Identification of the threats/impacts – actual or potential that could negatively impact the environmental conditions of the QIs within the European sites;
- Highlighting the activities of the proposed works that could give rise to significant negative impacts; and
- Identification of other plans or projects, for which In-combination impacts would likely have significant effects.

2.2.2 Screening Determination

In accordance with Regulation 42(7) of the Birds and Natural Habitats Regulations 2011 (S.I. No. 477/2011) as amended:

The public authority shall determine that an Appropriate Assessment of a plan or project is not required where the plan or project is not directly connected with or necessary to the management of the site as a European site and if it can be excluded on the basis of objective scientific information following screening under this Regulation, that the plan or project, individually or in combination with other plans or projects, will have a significant effect on a European site.

Further, under Regulation 42(8) (a):

Where, in relation to a plan or project for which an application for consent has been received, a public authority makes a determination that an Appropriate Assessment is required, the public authority shall give notice of the determination, including reasons for the determination of the public authority, to the following—

the applicant,

if appropriate, any person who made submissions or observations in relation to the application to the public authority, or

if appropriate, any party to an appeal or referral.

(b) Where a public authority has determined that an Appropriate Assessment is required in respect of a proposed development it may direct in the notice issued under subparagraph (a) that a Natura Impact Statement is required.

3 SCREENING FOR APPROPRIATE ASSESSMENT

This report forms Stage 1 of the AA process and sets out the following information:

- Management of the European sites,
- Description of the proposed Project,
- Characteristics of the European sites, and
- Assessment of Significance of the proposed bridge works on the European sites in question.

3.1 MANAGEMENT OF THE EUROPEAN SITES

The proposed M28 Cork to Ringaskiddy Road Project is not considered necessary to the successful management of the following European sites:

- Great Island Channel; and
- Cork Harbour SPA.

3.2 DESCRIPTION OF THE PROJECT OR PLAN

3.2.1 Location of Proposed Works

The proposed M28 Road Project is situated south-east of Cork City, along and nearby the existing N28 national roadway between the Bloomfield Interchange on the N40 (South Ring Road) and Ringaskiddy. The existing road provides a direct connection from Shannonpark, an important terminal point allowing access to Ringaskiddy to the east and Carrigaline, a commuter settlement town directly south of Shannonpark Cross. **Figure 1.1** displays the extent of the proposed route and its location with the existing and surrounding landscape.

Section 1.3 provides a detailed description of the proposed M28 Road Project elements.

3.2.2 Specific Objectives of the proposed M28 Road Project

The specific objectives of the proposed M28 Road Project are:

- To support the National Ports Policy and European TEN-T policy by improving the route from the Port at Ringaskiddy to the N40 so as to meet the definition of an Express Road;
- To provide a high quality transport corridor to TEN-T standards to access the Port of Cork marine port facilities at Ringaskiddy;
- To reduce peak hour congestion and travel delays in the N28 corridor, at an investment cost that offers good value for money;
- To improve the safety performance of the N28 corridor - the N28 has a poor record on fatal accidents in recent years, relating to the combination of heavy traffic flows, a significant proportion of heavy goods vehicles, and an inconsistent quality of route;

- To reduce the impact of the existing N28 on the human environment in the communities of Shanbally and Ringaskiddy, through which the road passes, while minimising the impact of any improvement works on the natural environment in the N28 corridor; and
- Improve accessibility to the Ringaskiddy peninsula for cyclists and other vulnerable road users, by removing through traffic from local roads where possible.

3.3 CHARACTERISTICS OF THE EUROPEAN SITES

3.3.1 Introduction

As outlined in **Section 1.2**, there are two European sites located within the zone of Influence of proposed M28 Road Project; i.e. Cork Harbour SPA and Great Island Channel SAC (See **Figure 3.1**). The study area supports connectivity to Cork Harbour SPA through three watercourses; Woodbrook Stream, Donnybrook Stream and the Glounatouig Stream. By extension, the study area supports remote connectivity to the Great Island Channel SAC through the open waters and tidal regimes of the greater Cork Harbour area connected to the watercourses identified above. Site descriptions, qualifying features and conservation objectives for these sites are provided below.

3.3.2 Background of Conservation Objectives of the European sites

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 qualifying features of the SAC as set out above.

European and national legislation places a collective obligation on Ireland and its citizens to maintain at favourable conservation status areas designated as SAC and SPA. The Government and its agencies 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; 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.

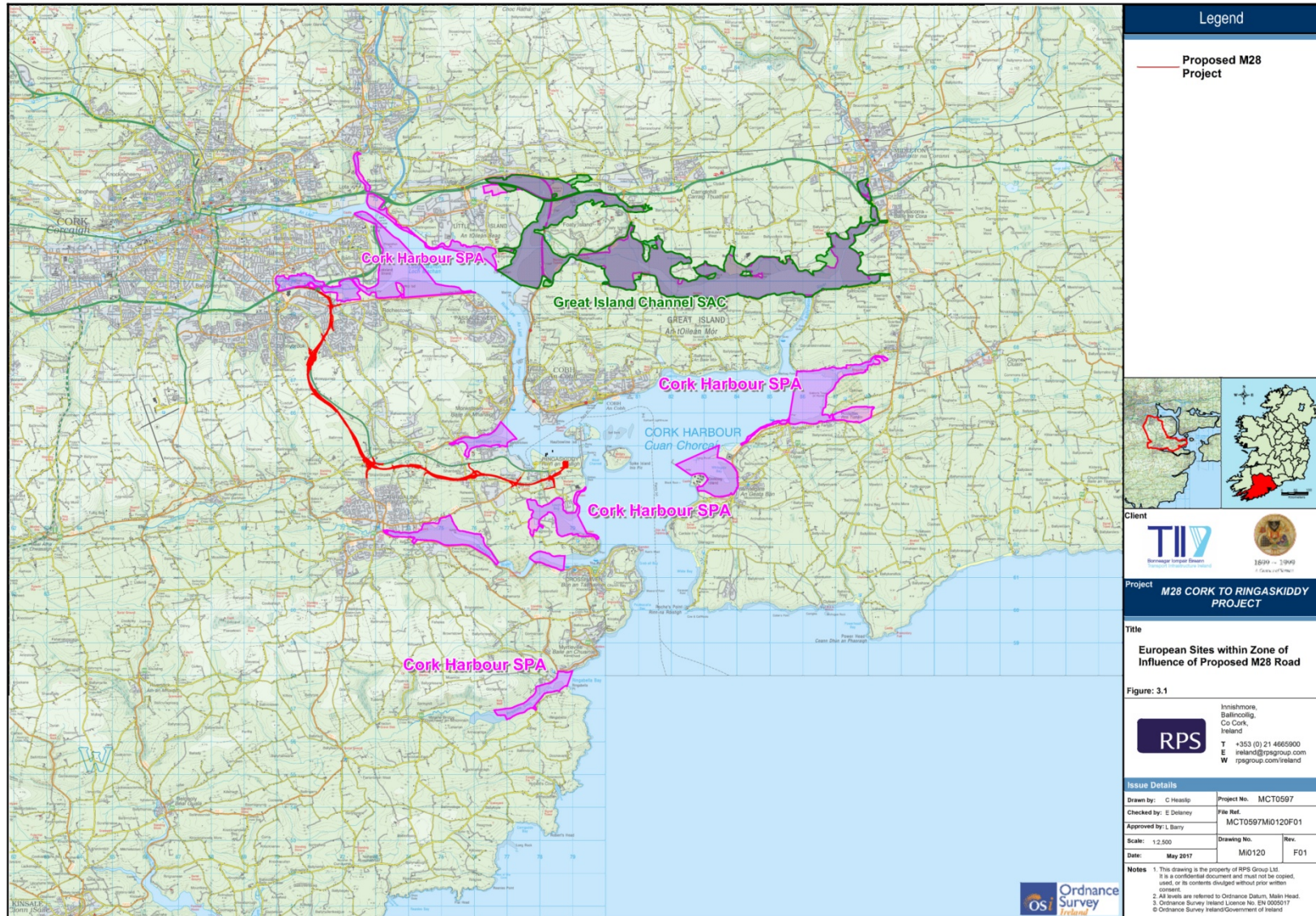


Figure 3.1 – European Sites within Zone of Influence of proposed M28 Road Project

3.3.3 Great Island Channel SAC

3.3.3.1 Site Description for Great Island Channel SAC

The Great Island Channel stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. It is an integral part of Cork Harbour which contains several other sites of conservation interest. Geologically, Cork Harbour consists of two large areas of open water in a limestone basin, separated from each other and the open sea by ridges of Old Red Sandstone. Within this system, Great Island Channel forms the eastern stretch of the river basin and, compared to the rest of Cork Harbour, is relatively undisturbed. Within the site is the estuary of the Owennacurra and Dungourney Rivers. These rivers, which flow through Midleton, provide the main source of freshwater to the North Channel.

The main habitats of conservation interest in Great Island Channel SAC are the sheltered tidal sand and mudflats and the Atlantic salt meadows. Owing to the sheltered conditions, the intertidal flats are composed mainly of soft muds. These muds support a range of macro-invertebrates, notably *Macoma balthica*, *Scrobicularia plana*, *Hydrobia ulvae*, *Nephtys hombergi*, *Nereis diversicolor* and *Corophium volutator*. Green algal species occur on the flats, especially *Ulva lactua* and *Enteromorpha* spp. Cordgrass (*Spartina* spp.) has colonised the intertidal flats in places, especially at *Rosslague* and *Belvelly*.

The site is extremely important for wintering waterfowl and is considered to contain three of the top five areas within Cork Harbour, namely North Channel, Harper's Island and Belvelly-Marino Point. Shelduck is the most frequent duck species with 800-1,000 birds centred on the Fota/Marino Point area. There are also large flocks of Teal and Wigeon, especially at the eastern end. Waders occur in the greatest density north of Rosslare, with Dunlin, Godwit, Curlew and Golden Plover the commonest species. A population of about 80 Grey Plover is a notable feature of the area. All the mudflats support feeding birds; the main roost sites are at Weir Island and Brown Island, and to the north of Fota at Killacloyne and Harper's Island. Ahanesk supports a roost also but is subject to disturbance. The numbers of Grey Plover and Shelduck, as given above, are of national importance (NPWS, 2013).

3.3.3.2 Qualifying Features of Great Island Channel SAC

The qualifying habitats and species found within Great Island Channel SAC with their main threats and impacts are set out below in **Figure 3.1**. The main threats are those which are listed in the Natura 2000 data form for the site and in the NPWS document "The Status of EU Protected Habitats and Species in Ireland" or the Article 17 and Article 11 Reports.

Table 3.1 – Qualifying Features of Great Island Channel SAC

Habitat Type (Annex I of the EU Habitats Directive)	Habitat Code	Main Threats and Impacts
Mudflats and sandflats not covered by seawater at low tide	1140	Pollution to surface waters, fishing and harvesting aquatic resources, bottom culture, hand collection, estuarine and coastal dredging, nautical sports, other outdoor sports and leisure activities.
Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)	1330	Grazing, cycle and walking tracks, disposal of household / recreational waste, disposal of industrial waste, land

Habitat Type (Annex I of the EU Habitats Directive)	Habitat Code	Main Threats and Impacts
		reclamation, erosion, invasive, non-native species and modification of hydrograph functioning.

3.3.3.3 Conservation Objectives for Great Island Channel SAC

Site-specific conservation objectives have been set of the Great Island Channel SAC. The detailed conservation objectives for each of the qualifying interests are provided in the Conservation Objectives document available on the NPWS website, as follows; https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO001058.pdf.

Along with the site-specific conservation objectives for the Great Island Channel SAC, the generic overall conservation objective assigned to all designated European sites also applies as follows:

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected (See **Table 3.1**).

3.3.4 Cork Harbour SPA

3.3.4.1 Site Description of Cork Harbour SPA

Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Douglas, Owenboy and Owennacurra. The SPA site comprises most of the main intertidal areas of Cork Harbour, including all of the North Channel, the Douglas River Estuary, inner Lough Mahon, Monkstown Creek, Lough Beg, the Owenboy River Estuary, Whitegate Bay and the Rostellan and Poul nabibe inlets. Cork Harbour is of major ornithological significance, being of international importance both for the total numbers of wintering birds (i.e. > 20,000) and also for its populations of Black-tailed Godwit and Redshank. In addition, there are at least 22 wintering species that have populations of national importance, as well as a nationally important breeding colony of Common Tern. Several of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Little Egret, Golden Plover, Bar-tailed Godwit, Ruff, Mediterranean Gull and Common Tern. The site provides both feeding and roosting sites for the various bird species that use it (NPWS, 2015).

Table 3.2 – Qualifying Species of Cork Harbour SPA

Species Name	Species Code	Main Threats and Impacts
Little Grebe (<i>Tachybaptus ruficollis</i>)	A004	Grazing, leisure fishing, discharges, nautical sports, walking, horse riding and non-motorised vehicles, water pollution, reclamation of land from sea, estuary or marsh, dykes, embankments, artificial beaches, fish and shellfish aquaculture, professional fishing, hunting, fertilisation, urbanised areas, human habitation, industrial or commercial areas, routes, autoroutes.
Great Crested Grebe (<i>Podiceps cristatus</i>)	A005	
Cormorant (<i>Phalacrocorax carbo</i>)	A0017	
Grey Heron (<i>Ardea cinerea</i>)	A028	
Shelduck (<i>Tadorna tadorna</i>)	A048	
Wigeon (<i>Anas penelope</i>)	A050	
Teal (<i>Anas crecca</i>)	A052	
Pintail (<i>Anas acuta</i>)	A054	
Shoveler (<i>Anas clypeata</i>)	A056	
Red-breasted Merganser (<i>Mergus serrator</i>)	A069	

Species Name	Species Code	Main Threats and Impacts
Oystercatcher (<i>Haematopus ostralegus</i>)	A130	
Golden Plover (<i>Pluvialis apricaria</i>)	A140	
Grey Plover (<i>Pluvialis squatarola</i>)	A141	
Lapwing (<i>Vanellus vanellus</i>)	A142	
Dunlin (<i>Calidris alpina</i>)	A149	
Black-tailed Godwit (<i>Limosa limosa</i>)	A156	
Bar-tailed Godwit (<i>Limosa lapponica</i>)	A157	
Curlew (<i>Numenius arquata</i>)	A160	
Redshank (<i>Tringa totanus</i>)	A162	
Black-headed Gull (<i>Chroicocephalus ridibundus</i>)	A179	
Common Gull (<i>Larus canus</i>)	A182	
Lesser Black-backed Gull (<i>Larus fuscus</i>)	A183	
Common Tern (<i>Sterna hirundo</i>)	A193	
Wetlands & Waterbirds	A999	

3.3.4.2 Conservation Objectives for Cork Harbour SPA

Site-specific conservation objectives have been set of the Cork Harbour SPA. The detailed conservation objectives for each of the qualifying interests are provided in the Conservation Objectives document available on the NPWS website, as follows; https://www.npws.ie/sites/default/files/protected-sites/conservation_objectives/CO004030.pdf.

Along with the site-specific conservation objectives for the Cork Harbour SPA, the generic overall conservation objective assigned to all designated European sites also applies as follows:

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected (See **Table 3.2**).

4 ASSESSMENT CRITERIA

This section assesses potential impacts, direct and indirect, to European sites within the project Zol. The assessment criterion follows the European Commission's methodological guidance (EC, 2002).

4.1.1 The individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European sites

The National Roads Authority (NRA²) *Guidelines for Assessment of Ecological Impacts of National Roads Schemes*³ identifies the following as typical activities from road construction activities to be sources of ecological impacts:

Construction Activities:

- *Vegetation and soil stripping;*
- *Other earthworks;*
- *Blasting and other excavations causing high levels of noise and vibration;*
- *Construction of structures and hard surfaces;*
- *Construction of barriers to wildlife movements such as berms, fences, median barriers;*
- *Construction site drainage;*
- *Demolition operations;*
- *Air pollution and dust deposition;*
- *Work associated with site compounds and storage areas;*
- *Temporary access routes;*
- *Lighting;*
- *Movement of plant and vehicles;*
- *Disturbance associated with the presence of construction staff;*
- *New planting; and*
- *Environmental incidents and accidents.*

Operational Activities:

- *Traffic use;*
- *Operational drainage;*
- *Lighting;*
- *Management of new planting; and*
- *Maintenance operations. (TII, 2009)*

The majority of these activities should be considered to be potential sources of impacts to the receiving environment as a result of the proposed M28 Road Project either as singular and/or in-combination impacts.

² Now Transport Infrastructure Ireland (TII)

³ <http://www.tii.ie/technical-services/environment/planning/Guidelines-for-Assessment-of-Ecological-Impacts-of-National-Road-Schemes.pdf>

With consideration given to the potential impacts and the proposed works of the M28 Road Project, elements of the project that have been determined likely to give rise to impacts on the European Site network are:

- Construction and operational phase pollutants entering tributaries and waterbodies draining the proposed M28 Road Project and service area, consequently entering downstream areas of Cork Harbour SPA;
- Construction and operational phase activities providing ongoing / continual disturbance of over-wintering waders and wildfowl associated with Cork Harbour SPA north of Lough Beg and environs. Furthermore, in the absence of best practice and construction design there is the potential for operational phase pollutants to enter watercourses draining the study area before entering nearby areas of Cork Harbour SPA; i.e. Monkstown Creek and the Douglas River Estuary, thereby impacting water quality and leading to ecotoxicity effects including a decline in prey diversity and abundance.

4.1.2 Likely direct, indirect or secondary impacts of the project on European sites

As the proposed M28 Road Project and service area are not located within the bounds of any European sites, there will be no direct impacts to those lands designated as part of Cork Harbour SPA and the Great Island Channel SAC.

Indirect impacts are possible given the study area's proximity and connectivity to European sites through three watercourses draining the road and its environs. Deterioration of water quality within these watercourses during the construction and operational phases could lead to indirect impacts to those nearby areas of Cork Harbour SPA; i.e. Monkstown Creek and the River Douglas Estuary. Further indirect impacts could occur during the projects construction and operational phase thereby, through disturbance of avifauna at their feeding sites north of Lough Beg.

4.1.2.1 Size and Scale

The area of both European sites is large when compared to the area of the proposed project. However, given the nature of the project and proximity and connectivity to European sites, potential impacts cannot be discounted. Following the assessment of the potential indirect impacts originating from the activities identified in **Section 4.1.1**, the anticipated changes from the operation of the M28 which could result in potential impacts to the European site network associated with size and scale of the proposed M28 Road Project are as follows;

- Increased and sustained anthropogenic activity in the area;
- Loss of feeding / foraging habitat outside Cork Harbour SPA which is used by SCI bird species; and
- Impacts on hydrology and water quality of those streams draining the proposed M28 Road Project and service area which support connectivity to European sites nearby, leading to water pollution and prey abundance and diversity.

4.1.2.2 Land Take

The proposed M28 Road Project will incorporate some of the existing N28 while the remainder of the route will largely traverse pastoral and arable habitats. The route will also overlap with existing local roadways, particularly between Shannonpark and Ringaskiddy, as well as travelling in close proximity to residential properties and amenity areas throughout the route. There will be no direct land take of Cork Harbour SPA and the Great Island Channel SAC as a result of the proposed works. However, improved grassland fields located to the north of Lough Beg have been used by over-wintering Curlew populations for feeding purposes.

There will be no land take of European sites associated with the proposed service area.

4.1.2.3 Distance from European sites or key features of the site

Cork Harbour SPA is broken up into site-specific sections of important bird areas associated with inlets, river estuaries and tidal channels. Two of these discrete segments are directly connected to the proposed M28 Road Project through the Woodbrook, Donnybrook and Glounatouig streams. The northern fringes of the proposed M28 Road Project are located less than 100 metres south of the River Douglas Estuary which is designated as Cork Harbour SPA. The Glounatouig Stream drains the southern extent of the proposed M28 Road Project and supports connectivity to Monkstown Creek, which is designated as part of Cork Harbour SPA. At Ringaskiddy, the proposed M28 Road Project is located 350 metres north of Lough Beg, which is designated as Cork Harbour SPA.

The proposed service area is located 1.3km south-east of the Monkstown Creek segment of Cork Harbour SPA and does not support connectivity to this European site.

The Great Island Channel SAC is located over 6km east of the proposed route. This European site is tenuously connected to the site via the open waters and tidal influences of Cork Harbour.

4.1.2.4 Resource Requirements

The proposed works will require the importation of material for construction including bituminous materials, concrete and concrete pouring equipment, steel for bridge improvements and timber for fencing. It is proposed that aggregate will be sourced locally from the adjacent Raffeen Quarry site which will be operated in accordance with the conditions of its permits and approvals. Fuel will be consumed by construction equipment while water will be required for various construction practices. It is not likely that the proposed M28 Road Project will have a significant impact on Cork Harbour SPA and Great Island Channel SAC with regard to resource requirements.

4.1.2.5 Emissions

There is potential for emissions associated with the proposed project affecting two main sources-water and air. Emissions to water could include sediment, silt, and hydrocarbons from plant machinery, etc. Emission to air will include fine particulate matter associated with ongoing excavations and other construction practices. As stated in earlier sections, such emissions have the potential to impact negatively on the qualifying features of the European sites (aquatic environment).

The construction and operational stages of the project will also cause the emission of normal vehicle emissions (carbon dioxide etc.). It is not anticipated that the extent of such emissions to air will have a negative effect on the qualifying features of the European sites.

4.1.2.6 Excavation Requirements

In the absence of best practice or mitigation, excavation requirements associated with the proposed development could impact those watercourses through the continued and sustained release of sediment and particulate matter. Such release of sediment and particulate matter could result in indirect impacts to those nearby sections of Cork Harbour SPA.

4.1.2.7 Transport Requirements

During construction; sustained and ongoing transport of personnel and raw materials will be required within the land-take and immediate surrounds of the proposed M28 Road Project. This will involve transport of material to and from the site. Ongoing and sustained transport during the construction phase could influence particulate matter levels in receiving watercourses draining the site that in turn could impact European sites located downstream.

4.1.2.8 Duration of Construction, Operation and Decommissioning

The proposed M28 Road Project will be constructed over a period of 36 months and any resulting effects will be temporary in nature. The proposed operational phase is long-term in nature and could result in permanent impacts to Cork Harbour SPA via disturbance of over-wintering avifauna associated with pastoral lands north of Lough Beg.

4.1.2.9 Cumulative Impacts with Other Plans and Projects in the Area

As part of the screening for AA, in addition to the proposed works, other relevant projects and plans in the region must also be considered at this stage. These plans and projects are considered further in this respect in **Error! Reference source not found.** below.

Table 4.1 – Potential In-Combination Effects of Other Plans and Project

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
<p>Cork County Development Plan 2014 -2020</p>	<p>There are two main documents which underpin the direction of spatial development in County Cork. Firstly, at a National level the National Spatial Strategy and secondly at a Regional level, the South West Regional Planning Guidelines (SWRPG)</p> <p>The National Spatial Strategy 2002- 2020 (NSS) generally proposes a more balanced pattern of spatial development for the state as a whole, based on continued growth in Greater Dublin but with a significant improvement in the rate of development in nine ‘Gateway’ cities and nine ‘Hub’ towns. The strategy emphasises the critical role of ‘Gateways’ and ‘Hubs’ in delivering future economic growth and designates Metropolitan Cork as a ‘Gateway’ and Mallow as a ‘Hub’ town.</p> <p>(SWRPG) prepared by the South West Regional Authority provides a broad canvas to steer the sustainable growth and prosperity of the region in line with the key principles of the national strategy. The Regional Planning Guidelines adopted in July 2010, set out the agreed population targets for growth to 2022 and for the first time, planning authorities now have to ensure that their development plans are consistent with them. The population targets in this core strategy are consistent with the 2022 population targets set out in the Regional Planning Guidelines.</p> <p>Development Plan Objectives</p> <p>CS 4-1: County Metropolitan Cork Strategic Planning Area</p> <p>d)In the Cork Harbour area generally, to protect and enhance the area’s natural and built heritage and establish an appropriate balance between competing</p>	<p>Positive Impacts – The following objective is set out in the Cork County Development Plan 2014-2020 for the protection of the European sites:</p> <p>H-E 2.1 – Site Designated for Nature Conservation</p> <p>Provide protection to all Natural Heritage sites designated or proposed for designation under National or European legislation and International Agreements, and to maintain or develop linkages between these. This includes Special Areas of Conservation, Special Protection Areas, Natural Heritage Areas, Refuges for Fauna and Ramsar sites.</p> <p>Objectives H-E 2.2, H-E 2.3, H-E 2.4, H-E 2.5, H-E 2.6 and H-E 2.7 all provide supporting functionality for the protection of European sites within the Cork County development plan area.</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>landuse to maximise the areas overall contribution to Metropolitan Cork while protecting the environmental resources of the Harbour;</p> <p>e) Assist in the redevelopment of the Cork City Docklands by providing for the relocation and development of industrial uses and major port facilities, primarily at Ringaskiddy, to where deepwater berths are viable and appropriate infrastructure is planned to facilitate freight transport.</p> <p>CS 3-1: Network of Settlements: Higher Order Settlements Gateway, Hub and Main Settlements</p> <p>Strategic Aim (City Environs – North and South)</p> <p>Growth in population and employment so that the Cork Gateway can compete effectively for investment and jobs. Develop to complement & consolidate the development of the city as a whole and providing enhanced potential to rebalance the City through new development in the north.</p> <p>Strategic Aim (City Environs - East and West)</p> <p>Consolidate employment at existing employment locations and planned for employment locations (Cork Science and Innovation Park) with improved supporting infrastructure, and in particular public transport improvements to provide linkages to local residential populations and Cork City.</p> <p>Strategic Aim (Metropolitan Towns (Including Carrigaline))</p> <p>Critical population growth, service and employment centres within the Cork “Gateway”, providing high levels of community facilities and amenities with infrastructure capacity high quality and integrated public transport connections should be the location of choice for most people especially those with an urban</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>employment focus.</p> <p>Development Plan Objectives</p> <p>County Development Plan Objective TM 3-1: National Road Network</p> <p>a) Seek the support of the National Roads Authority in the implementation of the following major projects:</p> <p>Projects Critical to the Delivery of Planned Development</p> <ul style="list-style-type: none"> • M28 (Cork – Ringaskiddy). • M8 (Dunkettle Interchange Upgrade). • Cork Northern Ring Road (N22/N20/M8). <p>Key NSS Projects</p> <ul style="list-style-type: none"> • M20 (Blarney – Mallow – Limerick). • N25 (Carrigtwohill – Middleton – Youghal). <p>Key Regional Projects</p> <ul style="list-style-type: none"> • N22 (Ballincollig – Macroom – Ballyvourney) to include Macroom Bypass. • N71 (Cork – Clonakilty – Skibbereen and Bantry). • N72 (Mallow Northern Relief Road). • N72 Mallow to Fermoy. • N73 (Mallow – Mitchelstown). <p>County Development Plan Objective TM 3-2: Regional & Local Roads</p> <p>a) Recognise the strategic role played by Regional Roads within the County and, together with Local Roads, to enhance their carrying capacity and safety profile in line with demand.</p> <p>b) Promote the improvement of strategic Regional and Local Roads throughout the County in accordance with the strategies identified for the main settlements in</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>this Plan.</p> <p>c) Seek funding for the following Regional and Local Roads Projects in the County (including the Carrigaline Inner Relief Road).</p> <p>County Development Plan Objective TM 5-2: Cork and Other Ports</p> <p>a) Ensure that the strategic port facilities at Ringaskiddy, Whitegate and Cork Airport have appropriate road transport capacity to facilitate their sustainable development in future years. See also Objective EE 62: Cork Harbour</p> <p>b) Support the relocation of port activities and other industry away from the upper harbour on the eastern approaches to the city. See also Objective EE 62: Cork Harbour</p> <p>c) Support Ringaskiddy as the preferred location for the relocation of the majority of port related activities having regard to the need for a significant improvement to the road network.</p> <p>County Development Plan Objective HE 2-3: Biodiversity outside Protected Areas</p> <p>Retain areas of local biodiversity value, ecological corridors and habitats that are features of the County's ecological network, and to protect these from inappropriate development. This includes rivers, lakes, streams and ponds, peatland and other wetland habitats, woodlands, hedgerows, tree lines, veteran trees, natural and semi-natural grasslands as well as coastal and marine habitats. It particularly includes habitats of special conservation significance in Cork as listed in Volume 2 Chapter 3 Nature Conservation Areas of the plan.</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>County Development Plan Objective HE 2-4: Protection of Wetlands</p> <p>Ensure that an appropriate level of assessment is completed in relation to wetland habitats subject to proposals which would involve drainage or reclamation. This includes lakes and ponds, watercourses, springs and swamps, marshes, heath, peatlands, some woodlands as well as some coastal and marine habitats.</p> <p>County Development Plan Objective HE 2-5: Trees and Woodlands</p> <p>a) Protect trees the subject of Tree Preservation Orders.</p> <p>b) Preserve and enhance the general level of tree cover in both town and country. Ensure that development proposals do not compromise important trees and include an appropriate level of new tree planting and where appropriate to make use of tree preservation orders to protect important trees or groups of trees which may be at risk or any tree(s) that warrants an order given its important amenity or historic value.</p> <p>c) Where appropriate, to protect mature trees/groups of mature trees and mature hedgerows that are not formally protected under Tree Preservation Orders.</p> <p>County Development Plan Objective HE 2-7: Control of Invasive Species</p> <p>Control the spread of invasive plant and animal species within the county.</p>	
<p>Cork County Development Plan 2014 – 2020 Stage 2: Natura Impact Report</p>	<p>This Natura Impact Report represents the final stage of Appropriate Assessment for the Cork County Development Plan. It summarises how Appropriate Assessment was integrated into each part of the County Development Plan and determines the</p>	<p>Assessment and identification of policies and objectives associate with the development plan that could impact European sites as part of the AA process. Subsequent amendment of policies and objectives to ensure compliance with the Habitats Directive and to</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	likelihood of impact associated with the various objectives and strategies comprising the County Development Plan.	ensure no potential impacts to European sites. No Potential for Impact.
Cork Biodiversity Action Plan 2009 -2014	<p>The overall aim of the County Cork Biodiversity Action Plan is to conserve and to enhance biodiversity, and to ensure that every person in the county has the opportunity to appreciate and understand its importance in our lives.</p> <p>Objective 1: To Review Biodiversity Information For County Cork and To Prioritise Habitats and Species For Conservation Action.</p> <p>Objective 2: To Collect Data And Use It To Inform Conservation Action And Decision Making.</p> <p>Objective 3: To Incorporate Positive Action For Biodiversity Into Local Authority Actions And Policy.</p> <p>Objective 4: To Promote Best Practice In Biodiversity Management And Protection.</p> <p>Objective 5: To Facilitate The Dissemination Of Biodiversity Information.</p> <p>Objective 6: To Raise Awareness Of County Cork's Biodiversity And Encourage People To Become Involved In Its Conservation.</p>	<p>The objectives underpinning this assessment will have a positive impact on nature conservation in the county and by extension European sites. The implementation of this plan, particularly the incorporation of positive biodiversity actions into Local Authority Plans and Policies will have a strategic influence on nature conservation in the county including the county's European sites.</p> <p>Overall Positive Impact</p>
Draft Ballincollig-Carrigaline Municipal District Area Local Area Plan 2017	<p>The policies and objectives of this Plan provide a framework for sustainable development responding to the needs of communities within the Municipal District. Once finalised this Plan will replace the previous Electoral Area Local Area Plans adopted in 2011. Carrigaline is divided between two Municipal Districts but for the purposes of this plan is being treated as one area. This section is also replicated in the Bandon/Kinsale Municipal District Local Area Plan. The following objectives are of relevance:</p>	<p>Neutral to Positive Impacts – Overarching and specific objectives provided to consider potential impacts to European sites and the designated site network as a whole. Plans and projects based on the plans and proposals within the LAP to be subject to the Appropriate Assessment process.</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>LAS-01 –</p> <p>a) In order to secure sustainable population growth proposed in each Main Town appropriate and sustainable water and waste water infrastructure that will help secure the objectives of the relevant River Basin Management Plan, needs to be provided in tandem with the development and where applicable protect the integrity of Natura 2000 sites.</p> <p>b) This plan, and individual projects based on the plans proposals, will be subject (as appropriate) to Strategic Environmental Assessment, Habitats Directive Assessment Screening and/or Assessment (Habitats Directive and Birds Directive) and Environmental Impact Assessment to ensure the parallel development and implementation of a range of sustainable measures to protect the integrity of the biodiversity of the area.</p> <p>c) Provide protection to all proposed and designated natural heritage sites and protected species within this planning area in accordance with HE2-1, and HE2-2 of the County Development Plan, 2014. This includes Special Areas of Conservation, Special Protection Areas and Natural Heritage Areas.</p> <p>d) Maintain where possible important features of the landscape which function as ecological corridors and areas of local biodiversity value, wetlands and features of geological value within this planning area in accordance with HE2-3, 2-4,2-5, and 2-6 of the County Development Plan, 2014.</p> <p>CARRIGALINE</p> <p>CL-GO-02: Environmental Designations In order to secure sustainable population growth proposed in GO -01 (a), appropriate and sustainable water and</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>wastewater infrastructure that will help secure the objectives of the relevant River Basin Management Plan, needs to be provided in tandem with the development and where applicable, protect the integrity of Natura 2000 sites. Carrigaline is situated adjacent to Cork Harbour Special Protection Area and in proximity to the Great Island Channel SAC. This plan will protect the favourable conservation status of these sites, and all new development shall be designed to ensure the protection and enhancement of biodiversity generally. Development proposals in unzoned parts of the settlement adjacent to the SAC and SPA will be likely to require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the requirements of the Habitats Directive and may only proceed where it can be shown that they will not have significant negative impact on these sites.</p> <p>CL-GO-03: Development Boundary The boundary of Carrigaline overlaps with and is adjacent to the Cork Harbour Special Area of Conservation and the Cork Harbour Special Protection Area. Development in the town will only be permitted where it is shown that it is compatible with the requirements of the Habitats Directive and the protection of these sites. Protection and enhancement of biodiversity resources within the receiving environment of the town will be encouraged.</p> <p>CL-U-05: Provide pedestrian walkway along old railway line from the river north towards Ballyhemiken.</p> <p>RINGASKIDDY RY-I Objectives 01 & 02; 06-19:</p> <p>Lands zoned for industrial development located in</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	proximity of Cork Harbour SPA.	
<p>Carrigaline Electoral Area Local Area Plan 2015</p>	<p>This plan provides a detailed planning framework for sustainable development responding to the needs of communities within the Carrigaline Electoral Area. It aims to deliver quality outcomes, based on consensus, that have been informed by meaningful and effective public participation.</p> <p>LAS 2-2 - This plan, and individual projects based on the plans proposals, will be subject (as appropriate) to Strategic Environmental Assessment, Habitats Directive Assessment Screening and/or Assessment (Habitats Directive and Birds Directive) and Environmental Impact Assessment to ensure the parallel development and implementation of a range of sustainable measures to protect the integrity of the biodiversity of the area.</p> <p>LAS 2-3 - It is an objective to provide protection to all proposed and designated natural heritage sites and protected species within this planning area in accordance with ENV 1-5, 1-6, 1-7 and 1-8 of the County Development Plan, 2009. This includes Special Areas of Conservation, Special Protection Areas and Natural Heritage Areas.</p> <p>LAS 2-4 - It is an objective to maintain where possible important features of the landscape which function as ecological corridors and areas of local biodiversity value and features of geological value within this planning area in accordance with ENV 1-9, 1-10, 1-11 and 1-12 of the County Development Plan , 2009.</p>	<p>Neutral to Positive Impacts – Overarching and specific objectives provided to consider potential impacts to European sites and the designated site network as a whole. Plans and projects based on the plans and proposals within the LAP to be subject to the Appropriate Assessment process.</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>I01 - Industry including ancillary uses such as associated offices, laboratories, manufacturing and utilities. The open space zonings in specific objectives O- 01 and O-02 shall be provided as part of this development. This zone is adjacent to Cork Harbour Special Protection Area. Development proposals in this zone are likely to require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the requirements of the Habitats Directive and may only proceed where it can be shown that they will not have significant negative impacts either alone or in combination with other projects on the SPA or on species for which the SPA is designated</p> <p>U-06 - Pedestrian walkway along river bank to Ballea Road. Development of this walk could give rise to disturbance to winter feeding sites and will require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the requirements of the Habitats Directive.</p> <p>U-07 - Pedestrian walkway along shoreline towards Coolmore. Development of this walk could give rise to disturbance to winter feeding sites and will require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the requirements of the Habitats Directive. The development of the walk may only proceed where it can be shown that it will not have an impact on the adjacent Special Protection Area.</p> <p>R-04 - Medium B density residential development. Development proposals in this zone will require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	<p>requirements of the Habitats Directive and may only proceed where it can be shown that they will not have significant negative impacts either alone or in combination with other projects on the adjacent SPA. A sea wall will be required along the eastern / southern boundary of the site.</p> <p>The timing and provision of appropriate drinking water and waste water disposal services for the development must be agreed with the Council before the layout and design of the development is commenced. This may include the provision of off-site and on-site infrastructure. Specific arrangements shall be made for the provision and construction an amenity walk (U-07).</p> <p>I-18 - Port Facilities and Port Related Activities. This zone is adjacent to the Cork Harbour Special Protection Area and partially overlaps Monkstown Creek proposed Natural Heritage Area. Development proposals in this zone are likely to require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the requirements of the Habitats Directive and may only proceed where it complies with procedures set out in Article 6 of the Habitats Directive.</p> <p>X-03 - Special Policy Area for sustainable harbour related recreation and tourism opportunities which will allow for improved public access to the water. This zone is adjacent to the Cork Harbour Special Protection Area. Development proposals may require the provision of an ecological impact assessment report (Natura Impact Statement) in accordance with the requirements of the Habitats Directive and may only proceed where it can be shown that neither they nor the activities that they may generate will have</p>	

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	significant negative impacts either alone or in combination with other projects on the SPA or on species for which the SPA is designated.	
Natura Impact Report for Carrigaline Electoral Area 2015	The Natura Impact Report for the Carrigaline Electoral Area Local Area Plan, 2011-2017 summarises how all of the recommendations arising from the initial Natura Impact Reports, and how ecological considerations generally, have been integrated into the Local Area Plan. It also contains the details of the monitoring measures which will be implemented to ensure that the undertakings in relation to the protection of the Natura 2000 network, as set out in the Local Area Plan, are met. Finally the report contains the AA Conclusion Statement which finds that, subject to a number of changes to text, objectives, settlement boundaries and zonings, which have been accepted by the Council and are contained in the final plan, there will be no significant impact on the network as a whole, nor to individual Natura 2000 sites or their dependant habitats and species.	Assessment and identification of policies and objectives associate with the development plan that could impact European sites as part of the AA process. Subsequent recommended amendments of policies and objectives to ensure compliance with the Habitats Directive and to ensure no potential impacts to European sites.
Southern River Basin District Management Plan (SRBDMP) 2009 -2015	The Western International RBD Management Plan, issued in July 2010, sets out a number of objectives and measures for all water bodies in the Northwestern International Region. Objectives: Ensure that the status of waters supporting protected areas is protected and (where necessary) improved by 2015. Measures: Implement 11 EU Directives, 9 other basic requirements.	The implementation and compliance with the environmental objectives of the SRBDMP will result in net positive in-combination effects to European sites. The implementation of this River Basin Management Plan 2009-2015 will have a Positive impact for watercourses in the southern region. It will not contribute to in-combination or cumulative impacts with the proposed M28 Road Project.
NPWS Conservation Management Plans	Conservation Management Plans have not yet been published for the European sites within the project's Zol. However the general and site specific conservation objectives have been published for these European sites.	The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. Generic and site-specific conservation objectives aim to define favourable conservation condition for a particular habitat or species at that site to ensure the ecological

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
		<p>integrity of these sites is maintained or restored. The resultant effects of conservation objectives are a net positive and there is no potential for adverse in combination effects on European sites. These plans will not contribute to in-combination or cumulative impacts with the proposed M28 Road Project.</p>
<p>Local Planning Applications⁴</p>	<p>Various local planning applications in proximity and within the ZoI of the proposed Road Project.</p>	<p>Adherence to the overarching policies and objectives of the Cork County Development Plan 2015 - 2020 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 and environmental considerations, there is no potential for adverse in combination effects on European sites.</p>
<p>Redevelopment of Existing Port Facilities at Ringaskiddy ABP PL04.PA0035</p>	<p>Redevelopment of existing port facilities at Ringaskiddy, Co. Cork, incorporating:</p> <ul style="list-style-type: none"> - Ringaskiddy East (Container berths and Multi-Purpose berth) - Ringaskiddy West (Deepwater Berth Extension) - Paddy's Point amenity area, - Road improvements and external road works, & - Associated development works 	<p>Potential for in-combination negative impacts where mitigation measures not be implemented for this development and the proposed M28 Road Project.</p> <p>The improvement to the port facilities will likely increase vessel activity in the area with an associated increase in underwater noise and risks of collisions for marine mammals, but it is considered that the impacts of this will not be significant on both the individual and population level for marine mammal species that frequent the area. There is also potential for pollution impacts during operation. The construction and</p>

⁴ The Local Planning Applications included in this potential in-combination impacts assessment support the following criteria; planning applications granted within the past five years that may contribute to potential cumulative impacts on European sites of concern. They include planning applications that support proximity or potential connectivity with proximal sections of Cork Harbour SPA such as Monkstown Creek, Douglas River Estuary or Lough Beg. Their development and operation could in-combination with the proposed M28 Road Project provide in-combination impacts to those screened in European sites.

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
		<p>operation of the proposed redevelopment has the potential to cause disturbance to otter. The proposed redevelopment has the potential to impact on bird species during operation with the potential for direct and indirect loss of habitat and food resources, visual and noise disturbance, increased predation risk and pollution. No significant residual effects upon terrestrial ecology or ornithology are predicted.</p>
<p>Dunkettle Interchange Improvement Motorway Scheme 2012 - CPO / EIS ABP PL04G.HA0039 - Motorway Scheme: Compulsory Order and /PL04G.MA0011- Motorway Scheme: Environmental Impact Statement.</p>	<p>"43 major structures of various forms comprising:</p> <ul style="list-style-type: none"> - 1 overbridge, - 7 underbridges, - 2 railway bridges, - 1 footbridge, - Modification of the northern approach structure to the Jack Lynch Tunnel - 7 retaining walls and 24 gantries, - Several culverts where the scheme crosses watercourses or intertidal areas - Pedestrian and cyclist facilities, together with ancillary and consequential works." <p>The findings of ABP Inspectors report on the NIS prepared for this scheme is as follows:</p> <p><i>Subject to the satisfactory implementation of the design mitigation, (which includes the proposed three stage surface water storage and treatment system of petrol interceptors, initial attenuation ponds and constructed wetlands) and compliance with the proposed mitigation measures specified in the revised schedule of commitments submitted to the Inspector at the Hearing on 9th January, 2013, to ameliorate risk of disturbance, sediment and pollutant release and invasive species spread during the construction phase, no significant adverse impact on the integrity of the SPA would occur and that no significant cumulative or</i></p> 	<p>This development is unlikely to contribute to cumulative or in-combination effects provided best practice and mitigation measures are implemented, as outlined in the EIS & NIS prepared for this project.</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
<p>East Tip Remediation Project ABP PL04.MT0001</p>	<p><i>residual negative impacts would occur.</i></p> <p>“Demolish and clear existing structures (including 3 no. buildings on site)</p> <ul style="list-style-type: none"> - Re-profile the site, - Construct a perimeter engineered structure (PES) and an engineered capping system with surface water drainage system – the PES would include a rock arbour on the sea side, - The provision of a public park on the site, - The provision of a playing pitch to replace the existing naval facility, - 2 no. 2-lane access roadways to provide segregated access from Haulbowline Bridge to the proposed public park and to the naval dockyard, with associated revised security arrangements, - Provision of new footpaths.” <p>Findings of the Natura Impact Statement for the scheme are as follows:</p> <p>The key potential pathways for impacts would be through possible contamination of the food chain from the disturbance of waste, and direct disturbance of birds feeding or roosting in the vicinity.</p> <p>Secondary impacts could be through the disturbance of sediments, the spread of invasive species, and light/vibration/noise during construction works. The NIS looked at direct and indirect impacts, as well as in-combination effects concluding that subject to appropriate controls the proposal will not adversely affect the integrity of the EU sites.</p> <p>Section 4.5.1 of the NIS sets out proposed mitigation for the construction phase and 4.5.2 sets out</p>	<p>This development is unlikely to contribute to cumulative or in-combination effects provided best practice and mitigation measures be implemented, as outlined in the NIS prepared for this project.</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
<p>DePuy Synthes Turbine CCC 15/6967</p>	<p>mitigation for the end use and aftercare stage.</p> <p>Erection of a wind turbine with hub height of up to 100m, rotor radius of up to 50.5m and overall height from ground to tip of rotor of up to 150.5m, upgrade of existing site roads, and all other associated works.</p> <p>An NIS and Environmental Impact Statement completed for this development. The NIS concluded that with the implementation of mitigation measures, that there will be no risk of significant adverse effects of the proposed development on Cork Harbour SPA.</p>	<p>This development is unlikely to contribute to cumulative or in-combination effects provided best practice and mitigation measures is implemented, as outlined in the EIS & NIS prepared for this project.</p>
<p>Cobh Cruise Berth CCC. 14/5807and ABP PL 04.244386</p>	<p>A new mooring dolphin structure immediately adjacent to the existing wall at Five Foot Way and 2 no. isolated mooring dolphin structures with mooring bollards, 2 no. access bridges and associated engineering works comprising piling and rock anchoring</p>	<p>Potential in-combination impacts to Cork Harbour SPA during the projects construction and operational phases to disturbance and consequent avoidance of avifaunal species from roosting and feeding sites within nearby areas of Cork Harbour SPA.</p>
<p>Martello Tower Site Reprofilng CCC 16/6219</p>	<p>Excavate soil and topsoil materials from a site and subsequent re-profilng and remediation of the site.</p> <p>AA was completed for this proposal assessing potential impacts to European sites, in particular the proximal areas of Cork Harbour SPA. The findings of the AA concluded that the study site does not support wintering waterbirds that represent a significant portion of the populations in Cork Harbour SPA and will not impact this European site.</p>	<p>This development is unlikely to contribute to cumulative or in-combination effects provided best practice and mitigation measures are implemented, as outlined in the EIS & NIS prepared for this project.</p>
<p>Indaver Waste to Energy Facility PL04 .PA0045</p>	<p>Development of a Waste to Energy Facility for the treatment of up to 240,000 tonnes per annum of residual household, commercial, industrial, non-hazardous and suitable hazardous waste.</p>	<p>This development is unlikely to contribute to cumulative or in-combination effects to Cork Harbour SPA provided best practice and mitigation measures are implemented for this project to attenuate emissions to receptors such as air, watercourses and the surrounding terrestrial environment.</p> <p>Furthermore, the footprint of this development does not support suitable habitat for avifaunal species</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
		<p>associated with Cork Harbour SPA and the findings of avifaunal surveys completed for this development did not identify this area as a suitable or viable site for over-wintering avifauna associated with Cork Harbour SPA.</p>
<p>Shannonpark Roundabout Housing Development CCC 16/4289</p>	<p>Demolition of a farmhouse and three outbuildings and the construction of a mixed use development consisting of residential development of 297 no. residential units, neighbourhood centre, public transport interchange and all ancillary site development works. The proposed development is Phase 1 of development envisaged by Astra Construction Services Ltd. and further phases will be subject to subsequent planning applications. The proposed 297 no. residential units consists of 46 no. detached dwellings, 230 no. semi-detached dwellings, 7 no. terraced units and 14 no. apartments to be provided in a two storey block with ancillary spaces including common/meeting room, laundry and storage rooms and management office. The proposed neighbourhood centre is 3 storeys in height and provides for 2 no. retail units, pharmacy and office/medical unit on ground floor level with ancillary yard areas, a 2 storey crèche on ground and first floor levels, office/medical use on first and second floor level and rooftop plant. Access to the proposed development will be via a new spine road from the Carrigaline Road which will also serve possible future phases of development. The proposed roadworks include road widening and the provision of a new signalised junction opposite the existing entrance to Carrig na Curra. The ancillary site development works consist of the diversion of the existing Raffeen Trabeg 110 kV ESB electrical cables and the diversion and undergrounding of the existing 38 kV ESB electrical</p>	<p>This development is unlikely to result in cumulative or in-combination effects to European sites. The footprint of this development does not support suitable habitat for avifaunal species associated with Cork Harbour SPA and the findings of avifaunal surveys completed for this development did not identify this area as a suitable or viable site for over-wintering avifauna associated with Cork Harbour SPA. Drainage design and water attenuation mitigation is proposed for this development restricting un-attenuated run-off to receiving watercourses including the Glounatouig Stream which supports connectivity to Monkstown Creek designated as part of Cork Harbour SPA.</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	cables, the diversion of an existing stream and all ancillary ground works including car parking, fencing and landscaped linear wetland park. The proposed public transport interchange is located adjacent to the proposed neighbourhood centre and provides for 50 no. car parking spaces.	
Marina at Whitepoint, Cobh CCC 10/52015	Installation of 74 berth marina with access platform and gangway, underground water treatment unit and associated infrastructure.	Potential in-combination impacts to Cork Harbour SPA during the projects construction and operational phases to disturbance and consequent avoidance of avifaunal species from roosting and feeding sites within Cork Harbour SPA.
Monkstown Marina CCC 15/4446 (Extension of Duration of 08/9317) and ABP PL04.236980	(a) Construction of a marina to provide 285 number berths, (b) construction of a three-storey over basement marina building to include cafe/bar/restaurant, gym, provision shop, public toilets, changing room, chandlery, marine training room, boat sales office, marina management office, public toilets, (c) dedicated gated rowing club, (d) 174 car parking spaces, (e) rock armour protection, (f) diesel and petrol refuelling facilities, (g) reclamation of foreshore to provide for the above, and (h) associated site works to include landscaping, pilling and underground bunded fuel tanks - Extension of duration to permission granted under Planning Reg. No. 08/9317 and PL04.236980.	Potential in-combination impacts to Cork Harbour SPA during the projects construction and operational phases due to disturbance and consequent avoidance of avifaunal species, particularly Common Tern, from breeding sites within nearby sections of Cork Harbour SPA. However, this development is unlikely to contribute to cumulative or in-combination effects provided best practice and mitigation measures are implemented, as outlined in the EIS & NIS prepared for this project.
Development of Pedestrian Cycle Greenway - Glenbrook to Raffeen Part 8 Planning Application	Greenway development situated along an abandoned railway line between Glenbrook and Raffeen. This proposed development is proximal to the Monkstown Creek portion of Cork Harbour SPA and could present in-combination impacts to this section of the European site.	This development has the potential for in-combination or cumulative impacts to Cork Harbour SPA given its proximity to Monkstown Creek which is designated as part of Cork Harbour SPA. Screening for AA has been prepared for this development considering potential impacts to European sites which include Cork Harbour SPA. This scheme has been designed to incorporate screen planting and physical barriers avoiding potential disturbance effects to avifaunal populations associated

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
		with Monkstown Creek and by extension Cork Harbour SPA. The Screening for AA completed for this development concluded that there will be no material impacts arising from the proposed M28 Road Project on European sites.
<p>Raffeen Quarry – Ballyhemiken CCC 06/10037 and ABP PL.04.225610</p>	<p>Continuation of quarrying activities to include processing of aggregates, landscaping, restoration and associated works under the existing Planning Permission.</p>	<p>Quarrying operations at Raffeen Quarry will not contribute to cumulative or in-combination impacts to Cork Harbour SPA. Quarrying operations to be regulated by terms of planning to include attenuation of water run-off to the Glounatouig stream which is a tributary of Cork Harbour SPA.</p>
<p>Cork Lower Harbour Main Drainage Scheme 04.YA0005 and 04.YM0001 (Alterations to 04.YA0005) and 04.YM0003 (Amendment to decision on LA Foreshore)</p>	<p>The Cork Lower Harbour Main Drainage Project will aim to provide enhanced wastewater treatment through the development of a new wastewater treatment plant at Shanbally County Cork. This project will significantly enhance the water quality in Cork Harbour. Currently, wastewater from Cobh, Carrigaline, Passage West/Monkstown and Ringaskiddy is discharged untreated into the Harbour.</p> <p>The Cork Lower Harbour Main Drainage Project consists of:</p> <ul style="list-style-type: none"> - A new wastewater treatment plant - 14 new pumping stations - Approximately 30km of new sewers and a drilled crossing under the estuary - Development to take place in Cobh, Carrigaline (including Crosshaven), Passage West/Monkstown (including Glenbrook) and Ringaskiddy (including Shanbally and Coolmore) County Cork. 	<p>Potential for in-combination effects to Cork Harbour SPA during the projects construction phases due to deterioration of water quality and disturbance effects to SCI species. However, this development is unlikely to contribute to cumulative or in-combination effects provided best practice and mitigation measures are implemented, as outlined NIS prepared for this project.</p>
<p>Janssen Biologics Planning applications to Cork County Council 13/6217,</p>	<p>Multiple planning applications for building upgrades,</p>	<p>Adherence to the overarching policies and objectives of the Cork County Development Plan 2015 - 2020</p>

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
144676, 145899, 145993, 146417, 146678, 154919, 155315, 167150	parking and ancillary developments	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 and environmental considerations, there is no potential for adverse in combination effects on European sites.
Novartis Planning applications to Cork County Council 134764, 135727, 135759, 145395 & 164146	Construction of new production facilities, storage units and ancillary upgrade works	Adherence to the overarching policies and objectives of the Cork County Development Plan 2015 - 2020 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 and environmental considerations, there is no potential for adverse in combination effects on European sites.
GE Healthcare Life Sciences Biopark	<p>A BioPark and all ancillary site development works including landscaping, fencing and signage. The proposed BioPark consists of no. 2 storey bio-manufacturing buildings, 4 no. 2 storey administration/laboratory buildings with roof top plant room, a 2 storey warehouse building with 6 storey storage tower, a 2 storey hydration facility building, a 2 storey central utilities building with external boiler flues, and a 2 storey canteen and administration building with roof top plant room and service yard.</p> <p>Primary access to the proposed development is from the R613 with a secondary access via an existing entrance from the L2496.</p>	<p>This development is unlikely to contribute to cumulative or in-combination effects to Cork Harbour SPA provided best practice and mitigation measures are implemented for this project to attenuate emissions to receptors such as air, watercourses and the surrounding terrestrial and coastal environments.</p> <p>The AA Screening undertaken for this development considered the SCI species for Cork Harbour SPA <i>are not expected to be present at or reliant on the habitats and resources available within the footprint or adjacent to the development site. and the risk of disturbance to wintering birds feeding or roosting within the Cork Harbour Special Protection Area (SPA) is low and it is unlikely that the proposed works would cause significant disturbance or displacement impacts on the SCI bird species..</i></p>
Maryborough Ridge Housing Development Planning application to Cork County Council 167271	Residential development works to include 200 no. residential units, crèche and all associated ancillary development works including the completion of a	This development is unlikely to contribute to cumulative or in-combination effects to Cork Harbour SPA provided best practice and mitigation measures

Plan / Programme / Project	Key Objectives / Policies / Proposals	Potential Impact
	roundabout and road improvements onto Maryborough Hill, footpaths and cycle lanes, bus stop, foul and storm water drainage, boundary treatments, landscaping and amenity areas and the removal of existing electricity transformer/substation and construction of new electricity substation.	are implemented for this project to attenuate emissions to receptors such as air, watercourses and the surrounding terrestrial and coastal environments.

4.1.2.10 Conclusion of Cumulative and In-Combination Impacts Assessment

Provided adherence to the overarching policies and objectives of the plans and programmes and best practice and mitigation measures are implemented for individual projects, there is no potential for the mentioned plans and projects to have a cumulative impact to European sites, in combination with the proposed M28 Road Project.

4.1.3 Likely Changes to the Site

4.1.3.1 Reduction of Habitat

The construction of the proposed M28 Road Project and service area will not result in habitat loss to European sites. However, there may be partial loss to feeding grounds located to the north of Lough Beg that support bird populations associated with Cork Harbour SPA.

4.1.3.2 Disturbance to Key Species

The proposed M28 Road Project will be in close proximity to Cork Harbour SPA at the Douglas River Estuary and Lough Beg. In addition, the proposed M28 Road Project will adjoin lands used as winter feeding grounds by Curlew, a SCI bird species for Cork Harbour SPA. As a result, there is potential for disturbance to this species during the project's construction and operational phases.

The service area does not lie in close proximity to European sites and therefore will not result in disturbance to key species associated with Cork Harbour SPA. The habitat types identified at the location of the proposed service area do not correspond to the preferred habitats of the species identified as being of Qualifying Features of the Cork Harbour SPA.

4.1.3.3 Habitats or Species Fragmentation

Fragmentation of the European site network will not occur as a result of the proposed M28 Road Project and service area development. There will be fragmentation to the non-designated landscape along the route which may impact local areas of ecological importance. The proposed M28 Road Project may result in fragmentation of species populations associated with the European Site network.

4.1.3.4 Reduction in Species Density

It is unlikely that there will be a significant direct loss of species density within the European sites as a result of the proposed M28 Road Project. However, highly localised species reduction may occur.

The construction and operation of the service area north-east of Ringaskiddy is unlikely to result in the reduction to species density as this development is located within an area of existing made ground that supports elevated levels of anthropogenic activity.

4.1.3.5 Changes in Key Indicators of Conservation Value

There may be changes in the conservation value of qualifying species associated with Cork Harbour SPA as a result of the proposed M28 Road Project. Works supporting connectivity to areas associated with Cork Harbour SPA may cause a reduction in the key indicators of conservation value (through reductions in receiving water quality or disturbance of key qualifying species) within the European sites.

4.1.3.6 Climate Change

It is not anticipated that the proposal will have any significant effects on the European sites or their qualifying features in this respect.

4.1.4 Likely impacts on the European sites as a whole in terms of: interference with key relationships that define the structure and function of the site

It is not considered likely that there will be any long term impacts to those key relationships that define the structure or function of the European sites resulting from the proposed project. Likely impacts associated with the proposed M28 Road Project include reductions in water quality, alteration of stream morphology and potential disturbance to Cork Harbour SPA during the proposed M28 Road Project construction and operational phase.

4.1.5 Indicators of Significance as a Result of the Identification of Effects

4.1.5.1 Loss

It is likely that the magnitude, intensity and integrity of loss in this respect will be low regarding European sites.

4.1.5.2 Fragmentation

Fragmentation of the European site network will not occur as a result of the proposed M28 Road Project and service area development. There will be fragmentation to the non-designated landscape along the route which is used by Cork Harbour SPA species.

4.1.5.3 Disruption

It is likely that the magnitude, intensity and integrity of disruption in this respect will be low. Where loss does occur, it will be located on non-designated landscapes along the route which is used by Cork Harbour SPA species.

4.1.5.4 Disturbance

As outlined, given the sites proximity and connectivity to Cork Harbour SPA (and adjacent lands used as Curlew feeding sites) there is potential disturbance to key qualifying species associated with this European site. It is likely that the magnitude, intensity and integrity of disturbance in this respect will be low.

4.1.5.5 Change in key elements of the site

It is likely that the magnitude, intensity and integrity of changes to key elements of the European sites in this respect will be low. Examples of key elements are water resources, water quality and species population density. Where changes do occur it will however be temporary and the impact will be significant for the duration of the impact if appropriate measures are not put in place.

4.1.5.6 The elements of the projects or plan, or combination of elements where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.

Potential impacts to European sites forming part of the Natura 2000 network as a result of proposed M28 Road Project have been examined through this assessment. Two European sites are present within the identified Zol. Cork Harbour SPA is in close proximity and supports direct connectivity to the proposed M28 Road Project via three watercourses. In addition, the proposed M28 Road Project presents potential disturbance impacts to avifaunal feeding habitat associated with Cork Harbour SPA.

4.2 CONCLUSION

The impacts of all aspects of the project are not known at this stage and the significance of potential impacts needs to be investigated further to quantify and qualify such potential impacts. Therefore, due to this uncertainty an Appropriate Assessment (Natura Impact Statement) is considered necessary.

APPENDIX A – NPWS SITE SYNOPSES

Site Name: Cork Harbour SPA

Site Code: 004030

Cork Harbour is a large, sheltered bay system, with several river estuaries - principally those of the Rivers Lee, Douglas, Owenboy and Owennacurra. The SPA site comprises most of the main intertidal areas of Cork Harbour, including all of the North Channel, the Douglas River Estuary, inner Lough Mahon, Monkstown Creek, Lough Beg, the Owenboy River Estuary, Whitegate Bay and the Rostellan and Poul nabibe inlets.

Owing to the sheltered conditions, the intertidal flats are often muddy in character. These muds support a range of macro-invertebrates, notably *Macoma balthica*, *Scrobicularia plana*, *Hydrobia ulvae*, *Nephtys hombergi*, *Nereis diversicolor* and *Corophium volutator*. Green algae species occur on the flats, especially *Ulva lactuca* and *Enteromorpha* spp. Cordgrass (*Spartina* spp.) has colonised the intertidal flats in places, especially where good shelter exists, such as at Rossleague and Belvelly in the North Channel. Salt marshes are scattered through the site and these provide high tide roosts for the birds. Salt marsh species present include Sea Purslane (*Halimione portulacoides*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Common Saltmarsh-grass (*Puccinellia maritima*), Sea Plantain (*Plantago maritima*), Laxflowered Sea-lavender (*Limonium humile*) and Sea Arrowgrass (*Triglochin maritima*). Some shallow bay water is included in the site. Cork Harbour is adjacent to a major urban centre and a major industrial centre. Rostellan Lake is a small brackish lake that is used by swans throughout the winter. The site also includes some marginal wet grassland areas used by feeding and roosting birds.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Little Grebe, Great Crested Grebe, Cormorant, Grey Heron, Shelduck, Wigeon, Teal, Pintail, Shoveler, Red-breasted Merganser, Oystercatcher, Golden Plover, Grey Plover, Lapwing, Dunlin, Blacktailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Black-headed Gull, Common Gull, Lesser Black-backed Gull and Common Tern. The site is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Cork Harbour is an internationally important wetland site, regularly supporting in excess of 20,000 wintering waterfowl, for which it is amongst the top five sites in the country. The two-year mean of summed annual peaks for the entire harbour complex was 55,401 for the period 1995/96 and 1996/97. Of particular note is that the site supports internationally important populations of Black-tailed Godwit (905) and Redshank (1,782) - all figures given are average winter means for the two winters 1995/96 and 1996/97. At least 18 other species have populations of national importance, as follows: Little Grebe (51), Great Crested Grebe (204), Cormorant (705), Grey Heron (63), Shelduck (2,093), Wigeon (1,852), Teal (922), Pintail (66), Shoveler (57), Red-breasted Merganser (88), Oystercatcher (1,404), Golden Plover (3,653), Grey Plover (84), Lapwing (7,688), Dunlin (10,373), Bartailed Godwit (417), Curlew (1,325) and Greenshank (26).

The Shelduck population is the largest in the country (over 10% of national total). The site has regionally or locally important populations of a range of other species, including Whooper Swan (10), Pochard (145) and Turnstone (79). Other species using the site include Gadwall (13), Mallard (456), Tufted Duck (113), Goldeneye (31), Coot (53), Mute Swan (38), Ringed Plover (34) and Knot (38). Cork Harbour is a nationally important site for gulls in winter and autumn, especially Black-headed Gull (4,704), Common Gull (3,180) and Lesser Black-backed Gull (1,440).

A range of passage waders occurs regularly in autumn, including such species as Ruff (5-10), Spotted Redshank (1-5) and Green Sandpiper (1-5). Numbers vary between years and usually a few of each of these species over-winter. The wintering birds in Cork Harbour have been monitored since the 1970s and are counted annually as part of the I-WeBS scheme.

Cork Harbour has a nationally important breeding colony of Common Tern (3-year mean of 69 pairs for the period 1998-2000, with a maximum of 102 pairs in 1995). The birds have nested in Cork Harbour since about 1970, and since 1983 on various artificial structures, notably derelict steel barges and the roof of a Martello Tower. The birds are monitored annually and the chicks are ringed.

Extensive areas of estuarine habitat have been reclaimed since about the 1950s for industrial, port-related and road projects, and further reclamation remains a threat. As Cork Harbour is adjacent to a major urban centre and a major industrial centre, water quality is variable, with the estuary of the River Lee and parts of the Inner Harbour being somewhat eutrophic. However, the polluted conditions may not be having significant impacts on the bird populations. Oil pollution from shipping in Cork Harbour is a general threat. Recreational activities are high in some areas of the harbour, including jet skiing which causes disturbance to roosting birds.

Cork Harbour is of major ornithological significance, being of international importance both for the total numbers of wintering birds (i.e. > 20,000) and also for its populations of Black-tailed Godwit and Redshank. In addition, there are at least 18 wintering species that have populations of national importance, as well as a nationally important breeding colony of Common Tern. Several of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Golden Plover, Bar-tailed Godwit, Ruff and Common Tern. The site provides both feeding and roosting sites for the various bird species that use it (NPWS, 2008).

Site Name: Great Island Channel SAC

Site Code: 001058

The Great Island Channel stretches from Little Island to Midleton, with its southern boundary being formed by Great Island. It is an integral part of Cork Harbour which contains several other sites of conservation interest. Geologically, Cork Harbour consists of two large areas of open water in a limestone basin, separated from each other and the open sea by ridges of Old Red Sandstone. Within this system, Great Island Channel forms the eastern stretch of the river basin and, compared to the rest of Cork Harbour, is relatively undisturbed. Within the site is the estuary of the Owennacurra and Dungourney Rivers. These rivers, which flow through Midleton, provide the main source of freshwater to the North Channel.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1140] Tidal Mudflats and Sandflats

[1330] Atlantic Salt Meadows

The main habitats of conservation interest in Great Island Channel SAC are the sheltered tidal sand and mudflats and the Atlantic salt meadows. Owing to the sheltered conditions, the intertidal flats are composed mainly of soft muds. These muds support a range of macro-invertebrates, notably *Macoma balthica*, *Scrobicularia plana*, *Hydrobia ulvae*, *Nephtys hombergi*, *Nereis diversicolor* and *Corophium volutator*. Green algal species occur on the flats, especially *Ulva lactuca* and

Enteromorpha spp. Cordgrass (*Spartina* spp.) has colonised the intertidal flats in places, especially at Rossleague and Belvelly.

The saltmarshes are scattered through the site and are all of the estuarine type on mud substrate. Species present include Sea Purslane (*Halimione portulacoides*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Common Saltmarsh-grass (*Puccinellia maritima*), Sea Plantain (*Plantago maritima*), Greater Sea-spurrey (*Spergularia media*), Lax-flowered Sea-lavender (*Limonium humile*), Sea Arrowgrass (*Triglochin maritimum*), Sea Mayweed (*Matricaria maritima*) and Red Fescue (*Festuca rubra*).

The site is extremely important for wintering waterfowl and is considered to contain three of the top five areas within Cork Harbour, namely North Channel, Harper's Island and Belvelly-Marino Point. Shelduck is the most frequent duck species with 800-1,000 birds centred on the Fota/Marino Point area. There are also large flocks of Teal and Wigeon, especially at the eastern end. Waders occur in the greatest density north of Rosslare, with Dunlin, Godwit, Curlew and Golden Plover the commonest species. A population of about 80 Grey Plover is a notable feature of the area. All the mudflats support feeding birds; the main roost sites are at Weir Island and Brown Island, and to the north of Fota at Killacloyne and Harper's Island. Ahanesk supports a roost also but is subject to disturbance. The numbers of Grey Plover and Shelduck, as given above, are of national importance. The site is an integral part of Cork Harbour which is a wetland of international importance for the birds it supports. Overall, Cork Harbour regularly holds over 20,000 waterfowl and contains internationally important numbers of Black-tailed Godwit (1,181) and Redshank (1,896), along with nationally important numbers of nineteen other species. Furthermore, it contains large Dunlin (12,019) and Lapwing (12,528) flocks. All counts are average peaks, 1994/95 – 1996/97. Much of the site falls within Cork Harbour Special Protection Area, an important bird area designated under the E.U. Birds Directive.

While the main land use within the site is aquaculture (oyster farming), the greatest threats to its conservation come from road works, infilling, sewage outflows and possible marina developments.

The site is of major importance for the two habitats listed on Annex I of the E.U. Habitats Directive, as well as for its important numbers of wintering waders and wildfowl. It also supports a good invertebrate fauna (NPWS, 2013).

APPENDIX B
OVER-WINTERING AVIFAUNAL SURVEYS COMPLETED IN 2014/15
AND IN 2015/16



**REPORT ON ORNITHOLOGICAL STUDIES UNDERTAKEN
FOR PROPOSED M28 CORK TO RINGASKIDDY
MOTORWAY SCHEME**



Prepared for RPS



April 2015

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1 Introduction

Glas Ecology have been commissioned by RPS to undertake ornithological studies in relation to the proposed upgrade of the M28 Motorway Scheme, linking Cork to Ringaskiddy. Field studies and desktop research were carried out to look at the following aspects of the existing bird populations within the vicinity of the proposed route for the road upgrade scheme:

- General wintering birds
- Barn Owl breeding survey

Following initial results of fieldwork and after consultation with National Parks and Wildlife Service (NPWS), the following additional studies were commissioned:

- Peregrine survey of Ballyhemiken quarry
- Curlew field feeding areas
- Impacts of habitat fragmentation on Curlew

The general wintering birds surveys comprised of two elements, one to describe the wintering bird populations along the route corridor and secondly to count wetland birds at Lough Beg. Lough Beg forms part of the Cork Harbour Special Protection Area (SPA), with Barnahely an area lying in the northwest of Lough Beg and forming part of the Lough Beg proposed Natural Heritage Area (pNHA). The Barn Owl survey was to determine if there are any Barn Owls occurring along the route, Barn Owls are a species that can be impacted by new roads.

Lough Beg lies to the south of Ringaskiddy and, as already mentioned, forms part of the Cork Harbour SPA. Some of the initial route corridor options passed through fields just north of Lough Beg. As a consequence, the Curlew field feeding area survey work was undertaken to locate the key field feeding areas in the vicinity of the route corridor and to determine if the route corridor could potentially impact on wintering Curlew populations. Curlew are one of the species that the Cork Harbour SPA has been designated for. Initial fieldwork also indicated that Curlew do use some of the fields as a feeding sites. Similarly, a field study was undertaken to determine if existing roads would deter Curlew from reaching feeding habitat.

Peregrine Falcon is a species listed under Annex I of the E.U. Birds Directive. Consultation with respect to the scheme has indicated that Ballyhemiken quarry is a site used by breeding Peregrines (Irish Raptor Study Group, *pers comm*) and therefore a survey was undertaken to determine if Peregrines are still using the site and also to identify any regularly used ledges within the quarry.

1.1 Description of Route Corridor

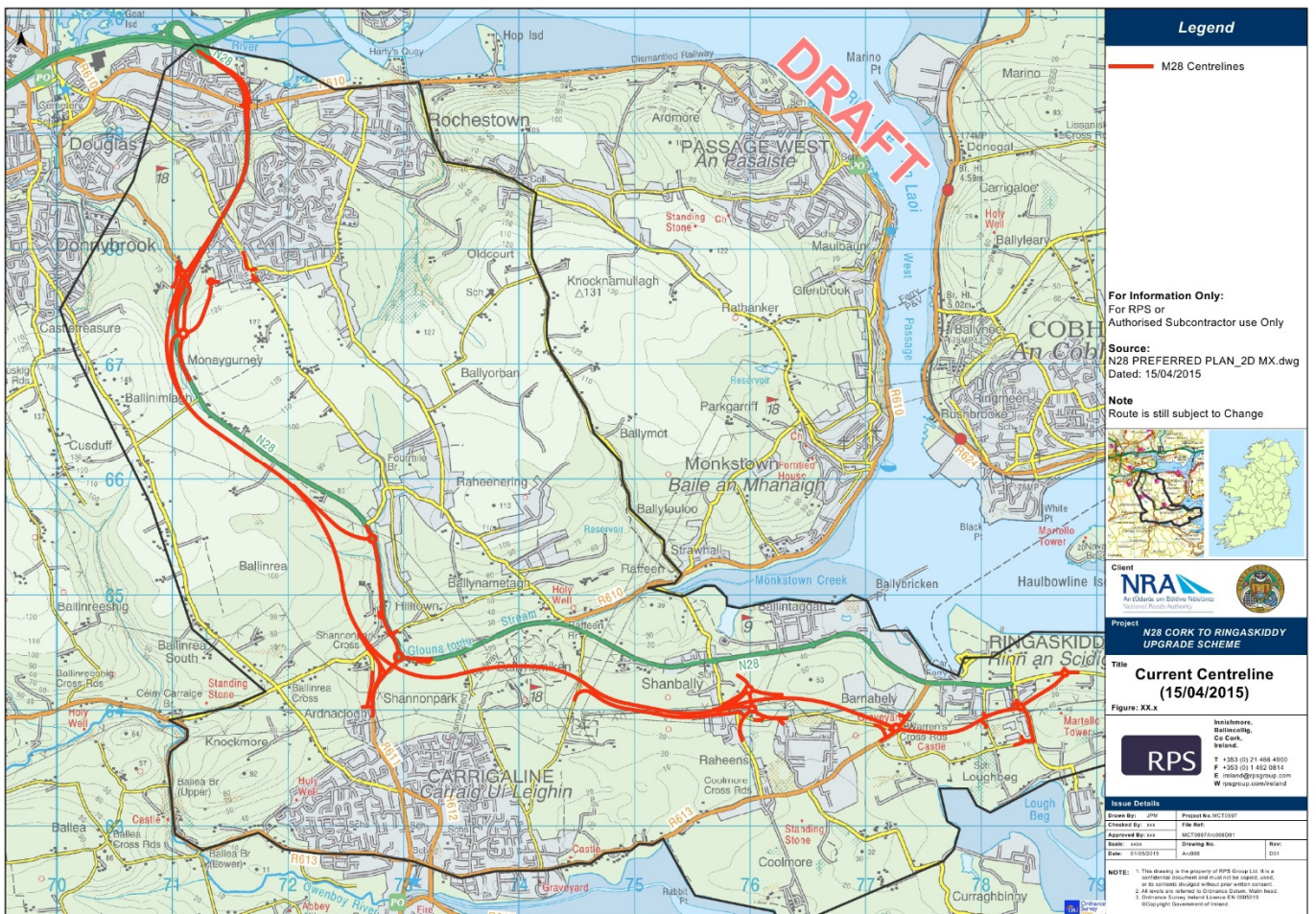
The proposed scheme comprises of the upgrade c. 12.5km of the N28 National Primary Route from the N28/N40 South Ring Road Bloomfield Junction to Ringaskiddy.

The proposed M28 Cork to Ringaskiddy Motorway scheme is a motorway route from the interchange with the N40 (Bloomfield Interchange) to the R613 Carrigaline to Ringaskiddy road at Barnahely. From

Barnahely, the scheme consists of an upgrade of the existing R613 to national road status. Also, a proposed single carriageway regional road will link to the east side of Ringaskiddy village.

The upgrade is substantially on-line between Bloomfield and Carrs Hill. South of Carrs Hill the route runs on the eastern side of the existing N28 to Shannonpark where it veers to an easterly direction, staying south of the existing road as far as the R613 at Barnahely. From there, local and port-bound traffic would continue either along the upgraded R613 (proposed N28) to the existing western entrance to the port, or along the new single carriageway link road running immediately south of Ringaskiddy village to a proposed new eastern entrance to the port. Figure 1 below shows the proposed route. This figure has been produced by RPS and is reproduced here.

Figure 1: Proposed route of M28 Motorway Scheme



2 Methodology

2.1 General wintering birds

The general wintering birds survey comprised of two elements:

- A transect based survey to look at wintering bird populations along the route of the road
- Wetland bird counts at Lough Beg

A series of transects were chosen along the route in order to cover the range of habitat types present in the area and to be able to describe the wintering populations throughout the route corridor. Each transect included had a minimum length of 250m and was located at least 350m apart from the next transect in order to avoid overlap and double counting of birds. A walkover survey of each of the transects was undertaken and any bird sightings or calls were recorded in distance bands from the transects as follows:

- 0-25m from the observer
- 25-100m from the observer
- Greater than 100m or flying over the transects

For analysis, only birds recorded within 100m were taken into account. Birds recorded at more than 100m or flying overhead were noted as casual or incidental species only.

Wetland bird counts were conducted at Lough Beg and coincided with high tide, analogous to the method used for the Irish Wetland Bird Survey (IWeBS). All birds seen within the Lough Beg count area were recorded. Data was compiled and analysed for reporting. Counts were conducted in weather deemed suitable for carrying out bird survey work, i.e. avoiding periods of high winds, heavy rainfall and poor visibility (Bibby *et al*, 2000).

2.2 Breeding Barn Owl

The Barn Owl survey follows the recommendations set out in Hardy *et al*, 2013, for carrying out Barn Owl surveys. It involves the identification of potential or previously known nest sites during the winter (i.e. outside of the breeding season). Follow up visits are made in the period April to June to check for active nests. Where buildings access was not possible, dusk visits were undertaken to look for Barn Owl activity. The Irish Raptor Study Group (IRSG) and local NPWS staff were also consulted to advise of any available information on Barn Owl activity in the area.

2.3 Peregrine Falcon Survey

A Peregrine Falcon survey of Ballyhemiken quarry was undertaken following the guidelines in Hardy *et al*, 2013. It involved carrying out two site visits, the first to check for site occupancy in the period of March to mid-April, with a second visit to check for breeding activity in the period between early May and mid-June. Again, the IRSG and NPWS were consulted to advise of any information on previous breeding activity at the site.

2.4 Curlew Field Feeding Areas

Key feeding areas for Curlew were identified by carrying out monthly counts from October 2014 to March 2015 inclusive. Counts were undertaken within four hours of high tide (*i.e.* two hours before and two hours after high tide), this period ties in with the IWeBS count period and covers the key wintering period. The areas covered by these counts are indicated in Figure 2 below and are outlined as follows:

- Lough Beg, fields to the west and to the north (to include the previously recorded Curlew feeding areas).
- Barnahely.
- Fields to the east of Warren's Cross Roads.
- Fields to the north of Lough Beg to include the field running north towards Ringaskiddy where Curlew have been recorded previously.
- The wetland adjoining Douglas Estuary.
- Fields around Ballinimlagh.

Additionally, other fields along the route between the Ringaskiddy roundabout and the eastern end of the route were scanned from adjacent roads or walked in order to locate any other regularly used feeding areas.

All key bird species (*i.e.* birds listed as key species for the Cork Harbour SPA) were counted and recorded and locations marked on maps. Counts were conducted in suitable weather conditions (Bibby *et al*, 2000).

There are a number of wind turbines associated with the pharmaceutical companies located within the Ringaskiddy area. As part of the planning applications for these developments, radar studies were undertaken to identify the movements of birds between Cork Harbour, Lough Beg and the surrounding area and to determine regularly used flightlines, roosts and feeding areas. These radar studies have been reviewed as part of this study. NPWS low water count data (Cummins & Crowe, 2011) was also reviewed to identify any known key field feeding areas around Lough Beg and the surrounding area.

2.5 Fragmentation of Curlew Feeding Habitat

As part of the consultation process for the scheme NPWS requested field studies to be undertaken to determine whether there is any evidence that road schemes deter Curlew from flying over roads to reach feeding areas, as the NPWS was concerned that this may lead to fragmentation of feeding habitat. Following this request a series of site visits were undertaken to an area located at the eastern side of Little Island to identify whether Curlew would feed close to the N25 or cross this road to reach suitable feeding habitat. Three visits in total were carried out in the period October 2014 to March 2015. The first site visit took place in October/November, the second site visit took place in December/January and the third site visit took place in February/March. Field surveys covered both low and high water to determine if there was any difference in the pattern of usage of fields over the tidal cycle. Desktop research was carried out to identify any published information on the impacts of road schemes on Curlew feeding habitat and usage.

3 Results

3.1 General Wintering Birds

3.1.1 Wintering Birds Transect Surveys

A total of seven transects were surveyed along the route. The transects were distributed along the route in order to cover all of the typical habitats present. Figure 2 shows the location of the transects whilst Table 1 below gives the transects’ GPS co-ordinates and a summary description.

Figure 2: Location of Wintering Birds Transects



Note: For example, ‘T7S’ equates to start of Transect 7, ‘T7E’ equates to end of Transect 7

Table 1: Wintering Birds Survey Transects

Transect number	Transect start (TS)	Transect end (TE)	Notes on habitats present
T1 (Lough Beg)	IW 78250, 63238	IW 78250, 63238	Lough Beg shoreline and local roads. Estuary, hedgerows, improved grassland and arable
T2 (Barnahely)	IW 77733, 63556	IW 77298, 63783	Improved grassland, arable, tidal inlet and wetland
T3 (Shanbally)	IW 75762, 63976	IW 74856, 64066	Improved grassland, hedgerows and arable
T4 (Ballyhemiken)	IW 74526, 64272	IW 74307, 64249	Adjacent to quarry and golf course. Habitats are arable, scrub and golf course
T5 (Shannonpark)	IW 72886, 64392	IW 72391, 65379	Rough grassland, stream and arable
T6 (Ballinimlagh)	IW 71120, 66624	IW 70951, 67279	Improved grassland, hedgerows
T7 (Donnybrook)	IW 71123, 67794	IW 71272, 68108	Improved grassland, scrub, mixed woodland

Each transect was surveyed twice; on 21st February and 19th March, 2014. These dates cover the latter part of the winter survey period, with surveys commencing as soon as the work was commissioned. The general small bird (passerine) community is likely to be the same between the early and later winter periods, but the late start date for these surveys may have missed early winter passage of birds such as Golden Plover. Weather conditions during the surveys were acceptable for undertaking bird survey work. Table 2 below outlines the peak figures (i.e. the highest number of birds recorded, taken over both survey visits) for bird counts recorded along each of the transects. Table 2 also gives the number of species recorded per transect.

Table 2: Peak Numbers of Birds Recorded along the Transects

Species	T1	T2	T3	T4	T5	T6	T7	BOCCI Status
Blackbird	2	2	4	1	2		3	Green
Blue Tit	5	8	3		3		4	Green
Brent Goose	1							Amber
Buzzard						2		Green
Chaffinch	5	3	1	3	6	2		Green
Coot				1				Amber
Cormorant	2							Amber
Curlew	56	1						Red
Dunnock	6	9	3	1	5		2	Green
Feral Pigeon	4							n/a
Goldcrest	2		2	2	1		4	Amber
Great Tit		2						Green
Greenfinch		1		4	2			Amber
Grey Heron	2							Green
Hooded Crow	13	1	2	1	6		2	Green

Species	T1	T2	T3	T4	T5	T6	T7	BOCCI Status
Jackdaw	12	12	4	7	5			Green
Little Grebe				1				Amber
Linnet						8		Amber
Long-tailed Tit	2							Green
Magpie	10	3	2				2	Green
Mallard		5		3				Green
Meadow Pipit						2		Red
Moorhen		3		1				Green
Oystercatcher	2							Amber
Pied Wagtail	1					2		Green
Raven	2							Green
Redshank	2	1						Red
Redwing	2				1			n/a
Robin	6	4	2	3	7	1	6	Amber
Rook		1	18		3	7		Green
Shelduck	2							Amber
Snipe					2			Amber
Song Thrush	1	1						Green
Starling	12							Amber
Woodpigeon	45	11	19		7	27		Green
Wren	10	4		1	2		2	Green
Yellowhammer					2			Red
No of species	25	18	11	13	15	8	8	

During the winter surveys, a total of 36 species were recorded. None of the species recorded during the field surveys are species that are listed under Annex I of the E.U. Birds Directive. Birdwatch Ireland and Royal Society for the Protection of Birds (RSPB) have produced a report detailing the conservation status of bird species in Ireland entitled; 'Birds of Conservation Concern in Ireland (BOCCI) (Colhoun & Cummins, 2013). In this document, birds of high conservation concern are placed on a red list, those of medium conservation concern are amber listed, whilst those of low or no conservation concern are green listed. Birds can be listed because of decline in their numbers or their range across Ireland. These declines can be the result of breeding and/or wintering populations. Four species that are red listed were recorded during the surveys including: Curlew, Meadow Pipit, Redshank and Yellowhammer. Twelve species that are amber listed were recorded including: Brent Goose, Coot, Cormorant, Goldcrest, Greenfinch, Little Grebe, Linnet, Oystercatcher, Robin, Shelduck, Snipe and Starling. The remaining species are either green listed or not listed (e.g. Feral Pigeon and Redwing).

T1 recorded the highest number of species (25). This is not surprising given that T1 contains a diversity of habitats including Lough Beg and the adjacent shoreline. T6 and T7 both held only 8 species. T6 contains improved grassland with some hedgerows, the grassland is intensively managed and therefore is unlikely to support a diversity of bird species. T7 contains areas of mixed woodland and scrub and is a habitat type that would be expected to hold a higher diversity of species (Nairn & O'Halloran, 2012).

The majority of what may be regarded as wetland species (Brent Goose, Cormorant, Curlew, Grey Heron, Oystercatcher, Redshank and Shelduck) were recorded on T1, on Lough Beg or the adjacent land. Four wetland species (Curlew, Mallard, Moorhen and Redshank) were recorded on T2, this transect includes the wetland area at Barnahely, the north-western end of Lough Beg. T4 also held four wetland species (Coot, Little Grebe, Mallard and Moorhen). These species were all recorded within a shallow pond area that occurs within Ballyhemiken Quarry.

The remaining species are all terrestrial species that are typically associated with the habitats present along the route (Balmer *et al*, 2013). Buzzard is a species that is of interest in that it is increasing and expanding its range in Ireland, with breeding first confirmed in Cork in 2004 (Cronin *et al*, 2009). Its conservation status is secure and it is Green listed on the BOCCI. Two birds were recorded in a mature treeline in T6. The two birds were recorded in area where nesting Buzzards have previously been reported (IRSG, *pers comm*). Yellowhammer was recorded on T5, a transect that contains a large area of arable fields with winter stubbles. This is a habitat that is associated with Yellowhammers, particularly in winter (Nairn & O'Halloran, 2012). As previously noted, Yellowhammer is a species that is red listed on the BOCCI list. It is a species that has undergone a decline in both breeding populations and range over the last 25 years (Colhoun & Cummins, 2013).

3.1.2 Lough Beg Counts

Three counts were carried out in February and March, 2014 on the following dates; 21st February, 18th and 19th March, 2014. Two of the counts (21st February and 18th March) were conducted at high tide, with the third count (19th March) taking place approximately two hours after high tide. The results from the counts are outlined in Table 3 below

Table 3: Lough Beg Counts

Species	BOCCI Status	21 Feb	18 March	19 March	Notes
Black-headed Gull	Red	20		15	
Black-tailed Godwit	<i>Amber</i>	85	190	4	18 March, most birds on 2 small islands
Brent Goose	<i>Amber</i>	5			
Common Gull	<i>Amber</i>	16		78	
Cormorant	<i>Amber</i>	2			
Curlew	Red	16	190	17	37 in field at western end of Lough on 21 Feb 18 March most birds are on shore on SE side of Lough
Golden Plover	Red		69		18 March most birds are on shore on SE side of Lough
Greenshank	Green	1		1	
Grey Heron	Green		4		
Herring Gull	Red	2			
Lesser Black-backed Gull	<i>Amber</i>			26	
Mallard	Green		2		
Oystercatcher	<i>Amber</i>	4	5	12	

Redshank	Red	34	9	12	18 March, most birds on 2 small islands
Shelduck	<i>Amber</i>	12	2	12	
Teal	<i>Amber</i>	18			
Wigeon	Red	12			

A total of 17 species were recorded during the counts. Of these six species are red listed under BOCCI including; Black-headed Gull, Curlew, Golden Plover, Herring Gull, Redshank and Wigeon. Eight of the species are amber listed including; Black-tailed Godwit, Brent Goose, Common Gull, Cormorant, Lesser Black-backed Gull, Oystercatcher, Shelduck and Teal. The remaining three species are green listed.

3.2 Breeding Barn Owl

During the winter transect surveys, only two areas where potential Barn Owl nest sites occur were identified. Potential nest sites include derelict buildings, large cavities in trees and stacks of bales, Hardey *et al*, 2013. Both of these potential Barn Owl nest sites lie at the south-eastern end of the route. The first of these is Barnahely Castle. The castle has no roof but the walls of the building are still intact and potentially could offer a nest site for Barn Owls. The second is a collection of buildings close to the National School near Barnahely. There are two old buildings close to the school that are heavily covered in Ivy, both no longer have the roof intact but do offer some potential for Barn Owl sites. The Barnahely Castle and one of the buildings close to the National School were fenced, with the second building surrounded by dense bramble growth and it was not possible to access any of the buildings.

The Barnahely survey visits were undertaken on 10th and 29th July, 2014. The surveys were carried out between 9pm and 1am. The Barn Owl activity surveys comprised of building surveillance in order to identify any potential Barn owl activity. It also included driving around the lanes within the Barnahely area and the surveillance of the tidal inlet in the north-west corner of Lough Beg area where the habitat appears to be suitable for the Barn Owl. No Barn Owls were identified within the Barnahely area during the site surveys.

NPWS and the IRSG local staff were consulted to identify any Barn Owl sites in the locality and no records were present.

3.3 Peregrine Falcon in Ballyhemiken Quarry

Two site surveys were undertaken to Ballyhemiken Quarry on 5th June and 11th July, 2014. These visits lie within the accepted periods for Peregrine surveys (Hardey *et al*, 2013) although an early season visit was not undertaken as the final route of the road had not been chosen at that time. No definite evidence of breeding was recorded on either occasion. On the first site visit, a male Peregrine was present and called frequently during the survey visit, indicating that there may have been a nest present. No birds were seen during the second site visit. A reliable report was received that a pair of birds was present in the quarry in late May (IRSG *pers comm.*). The results from the Peregrine Falcon survey undertaken as part of the ornithological studies for the M28 suggest that a breeding attempt was made but was not successful.

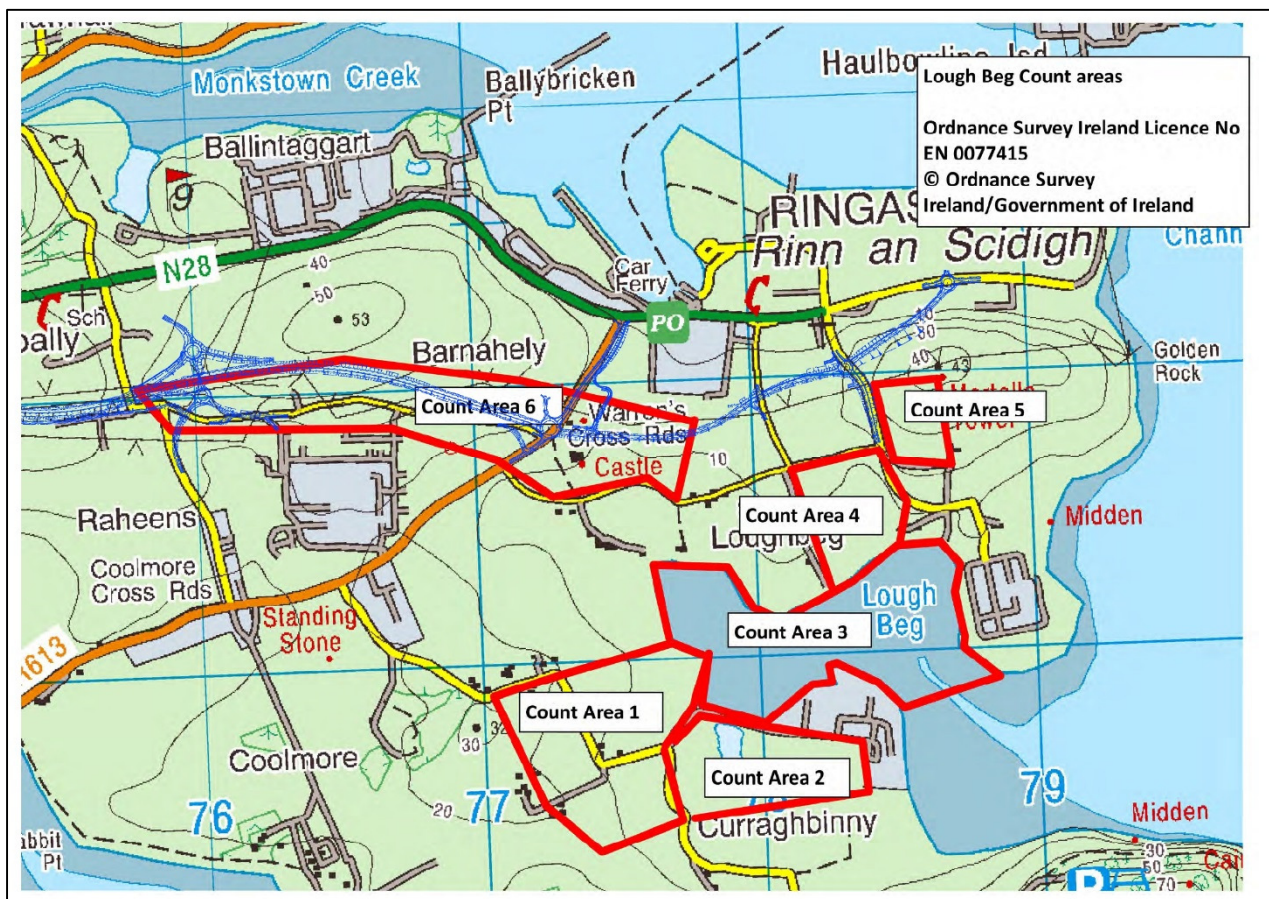
Peregrine Falcons have been known to breed at this location for at least the ten years. The nest site used in the past is on the south face of the quarry (IRSG, *pers comm.*).

The site survey did find that a pair of Kestrels did breed successfully in the quarry. Both birds were seen on both survey visits and a young bird was heard on the second survey. It is thought that the nest site was in the south-east of the quarry, possibly in the old Peregrine nest.

3.4 Curlew Field Feeding Areas

Monthly site visits with respect to Curlew field feeding areas were undertaken between October 2014 and March 2015. On each occasion, the location of birds feeding in fields and numbers of birds were mapped. Bird counts on Lough Beg were also undertaken. The key species for these counts are wading birds that feed in fields and that are features of the Cork Harbour SPA, i.e. Curlew, Oystercatcher, Golden Plover, Lapwing, Black-tailed Godwit and Redshank. The count areas were largely concentrated around the Lough Beg and Barnahely areas. However the proposed M28 route was also surveyed by scanning from roads or sections walked on each survey visit. Fields were scanned to identify any other flock of wintering birds. The count areas along with the proposed route alignment are shown in Figure 3.

Figure 3: Count Areas used for Field Feeding Studies



The only areas where wading birds were recorded comprised of the count areas centred on Lough Beg, i.e. Count Areas (CA) 1 to 5. Although no birds were recorded in CA6, this area was included as the bird studies for the Cork Harbour wind turbine developments had noted that wading birds would feed in the Barnahely area. CA2 is the wildlife reserve on the GlaxoSmithKilne land, nine Curlew were recorded in October and a single bird in November. This area lies to the south of Lough Beg and will not be impacted by the proposed road. CA3 is Lough Beg itself, whilst Curlew were recorded in each month over the winter survey period, it

is not an area that is used as a high tide feeding area by wading birds. The wading birds recorded in CA3 (including Redshank, Black-tailed Godwit and Dunlin) all use this area as a high tide roost, although it is highly likely that these species will also feed in areas at appropriate states of the tide as feeding areas are available. CA2 and CA3 are not considered relevant to the feeding area studies as they will not be impacted by the proposed scheme and are not considered further in this section as these areas are not likely to be impacted by the proposed scheme.

CA1 is an area of improved grassland fields lying to the west of Lough Beg. It lies approximately 1 km to the south of the proposed route, see Figure 3. The results of the counts for this area are outlined in Table 4 below. It identifies that Curlew were present in October, November, January and February. Black-tailed Godwit were only present in January.

Table 4: Results from Count Area 1

	31.10.2014	28.11.2014	22.12.2014	12.01.2015	13.02.2015	19.03.2015
Black-tailed Godwit				52		
Curlew	9	56		45	4	
Redshank				22		
Shelduck		4				

CA4 is an area of relatively small fields, the majority of which are improved grassland, but the southern area contains some areas of tilled land. This area lies to the south of the proposed route, see Figure 3. Counts from this area are outlined in Table 5 below. Small numbers of Curlew were recorded in this area in January and February. During the general winter bird transect survey, carried out in February 2014, 31 Curlew were recorded in this area. It appears that this area is occasionally used by Curlew but only in the late winter period.

Table 5: Results from Count Area 4

	31.10.2014	28.11.2014	22.12.2014	12.01.2015	13.02.2015	19.03.2015
Curlew				4	7	
Oystercatcher					5	

CA5 is an area of improved grassland that lies to the east of the proposed route (see Figure 3). Table 6 below gives the results of the counts from this area. Key species were only recorded from this area during the January count. During the general winter bird transect survey, carried out in February 2014, 25 Curlew were recorded in this area. It appears that this area is occasionally used by Curlew but only in the late winter period

Table 6: Results from Count Area 5

	31.10.2014	28.11.2014	22.12.2014	12.01.2015	13.02.2015	19.03.2015
Curlew				42		
Kestrel			1			
Oystercatcher				28		

Snipe		3				
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No key species were recorded feeding in CA6 or anywhere else along the proposed route as part of the Curlew feeding site visits. Reports of Curlew using the area around Ballinimlagh were received from surveyors undertaking habitat survey work for this proposed scheme and 35 birds were seen flying over this area in November. No feeding birds were recorded however.

3.5 Curlew Feeding Habitat Fragmentation

Three survey visits were made to the eastern end of Little Island on 3rd November 2014, 19th January and 27th March 2015. The visits covered the period of low and high tides. The aim of these site visits was to determine whether Curlew would be deterred from crossing between two areas of feeding habitat located on either side of the N25 Cork to Midleton road. During the November and January site visits, Curlew, Black-tailed Godwit, Redshank and Lapwing were all seen to be feeding in fields immediately south of the N25. Small numbers of these birds were seen to fly across the road, generally at approximately 10m above the road surface. In general the numbers of birds using the fields were small and maximum numbers are given in Table 7 below. No birds were recorded using these fields during the March site visit.

Table 7: Maximum Numbers of Birds using Fields Adjacent to N25

	03.11.2014	09.01.2015
Curlew	19	6
Black-tailed Godwit	9	45
Oystercatcher	26	
Lapwing		90
Redshank		1

4 Potential Impacts and Recommendations

Road schemes can impact on bird populations by direct loss of habitat, fragmentation of habitat, disruption of flightlines, indirect loss of habitat and by disturbance both during construction and whilst the road is in operation. These potential impacts are discussed within the separate sections of this ornithological study report. In describing impacts, reference is made to the definitions used in the EPA's 'Guidelines on the information to be contained in Environmental Impact Statements' (EPA, 2002).

4.1 General Wintering Birds

In general, the route largely passes through a farmed landscape including both tillage and grassland. The fields tend to be large with hedgerow boundaries of varying quality. The northern section in particular contains large arable fields. The wintering population studies showed a typical assemblage of birds that use lowland farmland in winter, with a relatively low number of species recorded. It is likely that the breeding bird assemblage will contain a similarly low diversity of species, with typical species such as Skylark and Meadow Pipit using the open grassland habitats and species such as Yellowhammer, Rook, Pheasant and small passerines using the hedgerow and associated cover as breeding habitat (Nairn & O'Halloran, 2012). Two notable species recorded during the winter surveys are Yellowhammer and Buzzard. Yellowhammer is a Red listed species on BOCCI, whilst Buzzard is of interest only in that it is a species that has undergone population increase and expansion of its range in Ireland in recent years. Buzzard is Green listed on the BOCCI and its conservation status is of low concern.

Construction of the road will lead to direct loss of habitat for wintering and breeding bird populations. Removal of hedgerows will lead to the loss of breeding habitat, whilst removal of grassland will lead to the loss of foraging areas for both breeding and wintering bird populations. Removal of areas of arable land will lead to the loss of wintering foraging areas for Yellowhammers. Temporary impacts could potentially arise through increased disturbance from construction traffic and temporary storage areas for spoil arising from construction.

In general, for species associated with grassland, the loss of habitat is likely to be an imperceptible impact due to the availability of alternative habitat in the vicinity. The red listed species, Meadow Pipit, was recorded but only on low numbers (two birds) on one transect. Meadow Pipit is red listed due to a decline in breeding populations. For a bird that is widespread throughout the County and country, it is likely that impacts arising from the construction of the road will be imperceptible and that changes in land use in the wider countryside are more likely to be important for maintaining populations of this species. Therefore, the final design of the road should allow for adjacent fields to still be viable for farming. Similarly, Yellowhammers will likely be more dependent on land use and again that the road design should allow arable fields to still be viable to ensure that winter stubbles are still present in the area, in which case the impact on Yellowhammer will be imperceptible. Loss of hedgerows and scrub can be mitigated for with appropriate planting schemes associated with the new road.

Buzzard is a species that is increasing in numbers and range in Ireland (Balmer *et al*, 2013). The construction of the road will potentially lead to the loss of the current breeding site. Within the wider landscape, mature trees within hedgerows are common and provide alternative nest sites. Buzzards will defend a territory

that can contain several nest sites (Cramp *et al*, 1980), and the loss of one nest site may not lead to an abandonment of a territory. The potential impact on Buzzards is likely to be imperceptible. If the existing nesting tree is to be removed, then tree felling must take place in the winter period, avoiding the breeding season.

4.2 Breeding Barn Owl

No breeding Barn Owls were identified as part of the surveys undertaken for this study. The local NPWS Ranger and IRSG have no records of Barn Owls presence within this area. Therefore it appears that Barn Owl does not occur as a breeding species in the locality. Outside the breeding season, Barn Owls can disperse widely throughout the countryside outside of known breeding areas. Road schemes can impact on Barn Owl populations through direct collisions with traffic. This has been highlighted recently with the deaths of Barn Owls along the Tralee by-pass. Shawyer & Dixon (1999), recommend mitigation measures that are to be used in areas which are potential or known 'blackspots' for Barn Owls. These potential blackspots include areas where the new road is intersected by ditches and streams. Mitigation measures include the use of banks in order to force Barn Owls to fly up and across the road at a height above the traffic. The main area along the route of the proposed road is in the Shannonpark area, in the vicinity of the existing roundabout. A qualified ecologist with ornithological expertise should be involved in the final design of the road in order to ensure appropriate measures are located accurately.

It is predicted that impacts on breeding Barn Owl will be neutral.

4.3 Breeding Peregrine Falcon

The proposed route of the road passes through the southern section of the Ballyhemiken Quarry. Potentially, construction of the road will lead to a temporary impact on the nest site through disturbance during the construction phase. Peregrine Falcons are well known to nest successfully in active quarries (e.g. Ruddock & Whitfield, 2007) with high levels of disturbance. However, the road will be constructed on an embankment which will require the importation of material into the quarry in order to construct the embankment. It is proposed that the embankment will be constructed so that the final height is approximately equal to the existing height of the southern quarry face. The nest site that has been used by Peregrines will therefore, be just below the height of the final, finished road surface. The foot of the embankment will be between 50-100m from the cliff face.

Given the proximity of the embankment to the cliff and the volume of traffic that will be required in order to import the material for building the embankment, it seems highly likely that the existing nest site will not be used during the construction phase, leading to a temporary negative impact on the nest site. Timing of works in the quarry should aim to start in late summer and be complete within 18 months so that this temporary impact only lasts for one breeding season.

It is difficult to predict whether the nest site will be used once the road is in operation. The road will be close to the nest site, but the nest site will no longer be subject to human disturbance. In the event of the nest site being abandoned, it is possible that alternative nest sites may be used. Alternative nest sites include other cliff faces within the quarry; there is another quarry at Coolmore which may provide suitable nesting ledges. Increasingly, Peregrine Falcon are using man-made structures including buildings and using urban areas (Madden *et al*, 2009), with successful nesting taking place in Cork City (Nairn & O'Halloran,

2012). In the event of the Peregrines continuing to use the existing nest site or an alternative nest site within the quarry, there is the potential for newly fledged birds to be killed by colliding with traffic on the road. This again is difficult to predict but once the road is operational, monitoring of the quarry for Peregrines and the potential loss of young birds to collision with traffic should be carried out for the first five years of operation. In the event that any fledged young from the nest within the quarry are killed on the road, then measures to prevent birds from nesting in the quarry should be undertaken. This will require full consultation with NPWS.

The recent Bird Atlas (Balmer *et al*, 2013) shows that Peregrine Falcon population in Ireland continues to increase in number and range, it is Green listed on BOCCI. Whilst construction of the road may lead to a temporary negative impact on the Peregrines that use the quarry during the construction phase, and potentially a permanent negative impact following construction, it will not have any impact on the Irish Peregrine Falcon population.

4.4 Curlew Field Feeding Areas

Surveys were undertaken to determine whether any regularly used Curlew (and other wading birds) feeding areas occur along the proposed route. Curlew is a feature of interest for the Cork Harbour SPA, results of these surveys are also used to determine whether there will be any impact on this designated site.

Figure 2 above shows the count areas used for the survey and section 3.4 details the results of the surveys. These show that they only regularly used area is CA1 (fields to the west of Lough Beg). CA4 and CA5 (fields lying adjacent or close to the north shore of Lough Beg) held birds only in the late winter period and during high tide period. None of these areas lie along the route of the road, with CA1 lying approximately 1km from the proposed route, meaning that disturbance impacts are unlikely. The surveys also covered the rest of the route and no other feeding areas were recorded. There are no regularly used feeding sites on the route of the road and therefore, there will be no impact on the wintering Curlew population and consequently no impact on the Cork Harbour SPA as a result of the construction and operation of the proposed road scheme.

4.5 Curlew Feeding Habitat Fragmentation

The field studies carried out were inconclusive as the numbers of birds using the chosen study area were relatively low. It was recorded that wading birds do use fields immediately adjacent to the N25 road and do fly over the road in order to reach mudflats and roosting areas to the north of the road. This indicates that Curlew, Oystercatcher and Black-tailed Godwits will fly over roads in order to reach feeding areas.

The field feeding studies (see sections 3.4 and 4.4) identify that there are no feeding areas along the route and the fields that Curlew use regularly for feeding will not be impacted by the proposed route of the M28 Motorway Scheme. The field feeding studies undertaken for this scheme did not find any other feeding areas within the vicinity of the proposed route. There will be no impact on wintering wading birds and their feeding areas through habitat fragmentation as a result.

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**M28 UPGRADE SCHEME: WINTER BIRD
SURVEYS 2015/16**

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**REPORT NUMBER: 1513-F1
STATUS OF REPORT: Revision 1
DATE OF REPORT: 05 April 2016**

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SUMMARY

Transect surveys were carried out to characterise the general wintering bird populations along the route corridor for the proposed M28 upgrade scheme. A total of 53 species were recorded on these transects, including eight species that are red-listed in Birds of Conservation Concern in Ireland, and a further 16 amber-listed species. The bird species recorded represent a typical bird assemblage for lowland agricultural habitats in southern Ireland. Apart from the waterbird species recorded in Lough Beg, none of these represent populations of specific conservation importance that require site-specific conservation measures.

Surveys of field feeding waders were carried out around Lough Beg and the eastern end of the route corridor, repeating work carried out in 2014/15. Across both these surveys, the only wader species (apart from Snipe) that was regularly recorded feeding in fields in these areas was Curlew, although Black-tailed Godwit have also been regularly recorded field feeding around Lough Beg in previous winters. The mean peak daily count of Curlew in field areas within, and adjacent to, the proposed route corridor was 11.8 birds. This probably represents around 0.5-0.8% of the Cork Harbour mid-winter Curlew population.

A review of a long-term dataset on Curlew field feeding in another part of Cork Harbour (the Glounthaune Estuary/Slatty Water area) shows that Curlew routinely feed on fields immediately adjacent to the N25 dual carriageway, and found no evidence that fields further from the dual carriageway were preferred by Curlew.

The results of this study indicate that:

- Any Curlew displaced from field feeding areas by direct habitat loss due to the proposed road scheme are likely to be able to find suitable alternative habitat.
- There is no potential for any fragmentation impacts to affect Curlew usage of field feeding areas.
- Any disturbance impacts (from the operational road) to adjacent habitats will be minor and will not cause large-scale exclusion of Curlew from adjoining habitats.

1. INTRODUCTION

1.1. CONTEXT

This report presents the results of winter bird surveys for the M28 upgrade scheme, commissioned by the RPS Group Ltd. This work is a continuation of survey work carried out in the winters of 2013/14 and 2014/15 by Glas Ecology. The results of that work were presented in *Report on Ornithological studies undertaken for the proposed M28 Cork to Ringaskiddy Motorway Scheme* (Glas Ecology, 2015; referred to as the Glas Ecology report hereafter).

1.2. TERMS OF REFERENCE

The terms of reference for the work included:

- Transect surveys to characterise the general wintering bird populations along the route corridor.
- Surveys of Curlew, and other field feeding waders, across six designated count areas.
- High tide counts of Lough Beg. In order to allow the counts to be carried out on the same days as the field feeding surveys, the counts were restricted to wader species that routinely feed in fields (Oystercatcher, Golden Plover, Lapwing, Black-tailed Godwit and Curlew).
- A review of data on wader field feeding in the Cork Harbour area, and assessment of potential habitat fragmentation impacts, based on my own personal data and other published studies.

1.3. STRUCTURE OF THIS REPORT

Section 2 of this report presents the results of the transect surveys and provides an assessment of the conservation importance of the general wintering bird populations along the route corridor. The remainder of the report provides an assessment of the status of field feeding wader populations in areas that may be affected by the proposed scheme (Section 3), analyses a long term dataset on field feeding Curlew in another area of Cork Harbour (Section 4), and provides a review of the potential impact of the proposed route on the Cork Harbour Curlew population (Section 5).

2. GENERAL WINTERING BIRDS

2.1. METHODOLOGY

The general wintering bird populations along the route corridor were surveyed by repeating the transect counts carried out in 2014/15.

The same seven transects were used for the survey as in 2014/15. The Glas Ecology report on the 2014/15 surveys only gives the start/end points for the transects. Therefore, to determine the exact routes of the transects, the author of that report was consulted. The transect routes used in 2015/16 are shown in Figure 1. These are considered to be as close as possible to the routes used in 2014/15, although there may be some minor differences.

The transect counts used the same recording methodology as in 2014/15. This is based on the standard Countryside Bird Survey (CBS) methodology (BirdWatch Ireland, 2012) and involves recording birds separately in three distance bands (0-25 m, 25-100 m and > 100 m), as well as overflying birds. Any additional notable bird species detected on the return walk along the transect route were also recorded separately. Each transect took 5-34 minutes to complete, depending upon the length of the transect and the level of bird activity encountered (Table 1). Weather conditions during the transect counts were generally good (Table 1). Showers/drizzle occurred on two of the transects during the January count, but did not appear to affect bird activity on these transects. Traffic noise affected the detectability of birds on T6, T7 and parts of T1 and T5.

Table 1 Timings of, and weather conditions during, the transect counts, 2015/16.

Date	Transect	Start	Finish	Cloud	Wind	Rain
11/12/2015	T1	09:24	09:58	1	W2	1
	T2	10:11	10:23	1	W2	1
	T3	10:48	11:04	1	W3	1
	T4	11:30	11:36	1	W4	1
	T5	11:49	12:13	1	W3	1
	T6	12:44	13:00	1	W2	1
	T7	13:08	13:19	1	W2	1
29/01/2016	T1	16:23	16:56	3	SW4	2/3
	T2	16:00	16:12	3	SW4	2
	T3	15:04	15:20	3	SW4	1
	T4	14:50	14:54	3	SW4	1
	T5	13:56	14:22	3	SW4	1
	T6	13:18	13:31	3	SW3	1
	T7	13:01	13:07	1	SW4	1
15/02/2016	T1	12:53	13:24	1	W1	1
	T2	13:36	13:48	1	E2	1
	T3	14:26	14:45	1	no wind	1
	T4	15:08	15:13	1	no wind	1
	T5	15:29	15:56	2	no wind	1
	T6	16:20	16:34	2	no wind	1
	T7	16:49	16:57	3	SE1	1

Cloud cover: 1 = 0-33%, 2 = 34-66%, 3 = 67-100%.

Wind: compass direction and Beaufort scale.

Rain: 1 = on rain; 2 = showers; 3 = drizzle.

2.2. GENERAL WINTERING BIRDS

A total of 47 species were recorded in the 0-25 m and 25-100 m distance bands along the transect counts (Table 2), with an additional six species recorded outside these distance bands, overflying the transects, or on return walks along the transect routes (Table 3). These included eight species

that are red-listed in Birds of Conservation Concern in Ireland (BoCCI) (Colhoun and Cummins, 2013): Curlew, Dunlin, Redshank, Black-headed Gull, Herring Gull, Grey Wagtail, Meadow Pipit and Yellowhammer. A further 16 BoCCI amber-listed species were recorded: Shelduck, Teal, Sparrowhawk, Oystercatcher, Jack Snipe, Snipe, Common Gull, Stock Dove, Goldcrest, Skylark, Starling, Mistle Thrush, Robin, House Sparrow, Greenfinch and Linnet. BoCCI red and amber-listing can refer to large-scale declines in species population and distribution, and listed species may still be widespread and common. The red- and amber-listed species recorded on the transect counts are mainly species that are widespread in lowland agricultural landscapes in southern Ireland in winter, as well as a few waterbird species recorded in Lough Beg on transect T1. The most notable species recorded was Jack Snipe: a single bird was flushed from improved grassland on the return walk along transect T6 on 15/02/2016. This is a widespread, but scarce, wintering species that typically occurs in freshwater marshes and wetlands. The record from transect T6 presumably refers to a casual visitor, as the habitat is not typical for the species. Therefore, this record does not indicate the presence of a regular wintering population and is not of any conservation significance.

The highest number of species were recorded on T1 (32 species), and the lowest numbers on T4 (6 species). Overall, the main factor explaining variation in species number between transects was the transect length (Text Figure 1). In addition, the species numbers recorded along T1 were increased by the proximity of the transect to Lough Beg, which allowed various waterbird species to be recorded that were not recorded along the other transects. When these additional species are factored out, the transect with the highest number of species relative to its length was T2 (Text Figure 1). This transect followed well-developed hedgerows/treelines along its entire route, unlike the other transects (except T1), which all included sections crossing open fields. Therefore, the route of T2 maximised opportunities for recording bird species (as the majority of species are mainly associated with the field boundary habitats, rather than the open fields). The circular route of T1 meant that the transect covered a smaller area, relative to its length, compared to the other transects.

The overall number species recorded was higher on the 2015/16 transects compared to the 2014/15 transects, reflecting the increased number of counts (there were only two transect counts in 2014/15, compared to three in 2015/16). The general pattern of increasing species numbers with increasing transect length is also shown by the 2014/15 data, as well as the relatively high numbers recorded on transect T2 (Text Figure 1). However, higher numbers of species were recorded on transect T4 in 2014/15. These included two wetland species (Moorhen and Coot) that were recorded in a pond in the quarry in 2014/15.

Table 2 Maximum numbers of birds recorded on the transect counts, 2015/16.

Species	Transect							BoCCI
	T1	T2	T3	T4	T5	T6	T7	
Shelduck	4							Amber
Teal	4							Amber
Mallard					3			Green
Pheasant	1							
Little Egret		1						Green
Grey Heron	1							Green
Sparrowhawk					1	1		Amber
Buzzard						1		Green
Oystercatcher	3							Amber
Curlew	12	4						Red
Turnstone	1							Green
Greenshank	2							Green
Redshank	5							Red
Snipe			1		1	1		Amber

Species	Transect							BoCCI
	T1	T2	T3	T4	T5	T6	T7	
Black-headed Gull	15							Red
Herring Gull	1							Red
Feral Pigeon	1							
Stock Dove					13			Amber
Woodpigeon	22	9	3		7	21	3	Green
Magpie	5	1		1		1		Green
Jackdaw	24	50		1	40			Green
Rook	7	200	5		60			Green
Hooded Crow	4		1		1		4	Green
Raven	1							Green
Goldcrest	1	1	1			1		Amber
Blue Tit	1	1	2		1	1	2	Green
Great Tit	1	1	3		1	1	1	Green
Long-tailed Tit	3		3					Green
Chiffchaff		1						Green
Wren	2	3	3	1	2	2		Green
Starling			1			1		Amber
Blackbird	6	4	4	1	3	3	2	Green
Song Thrush	3	2	3		1	2		
Redwing	1	3	2		54	6		
Mistle Thrush							1	Amber
Robin	8	6	3	2	3	3	3	Amber
Dunnock	2	3	4	1	3	1	2	Green
House Sparrow			7					Amber
Pied Wagtail	1	1	2					Green
Meadow Pipit	2	1	8		1			Red
Chaffinch	26	15	1		40			Green
Bullfinch		1				2		Green
Greenfinch							1	Amber
Linnet					110			Amber
Goldfinch	1	1						Green
Siskin						1		
Yellowhammer					6			Red
No of species	32	21	19	6	20	17	9	

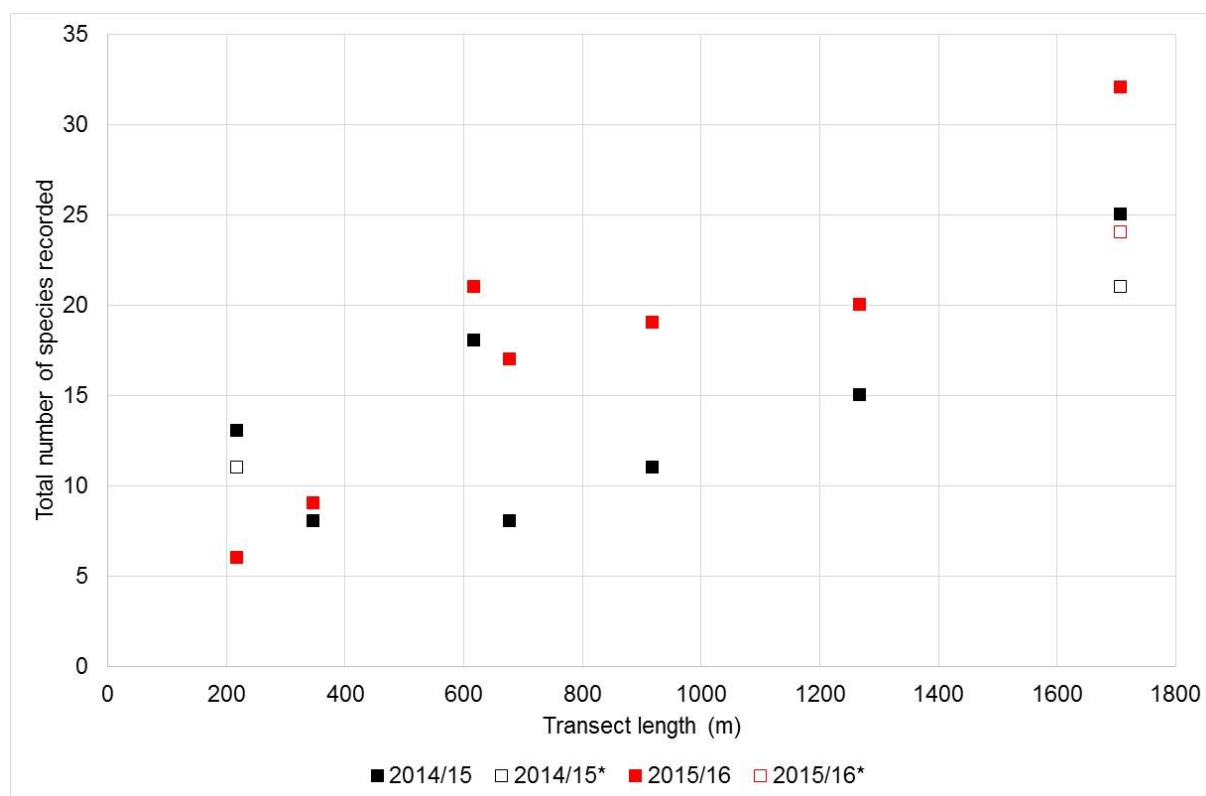
The data in this table only includes birds recorded within the 0-25 m and 25-100 m distance bands.

BoCCI = Birds of Conservation Concern Ireland listings (Colhoun and Cummins, 2013); note that no listings are given for Pheasant, Feral Pigeon, Song Thrush, Redwing and Siskin.

Table 3 Additional species recorded on the transect counts, 2015/16.

Species	Category	Transect	BoCCI
Dunlin	> 100 m	T1	Red
Jack Snipe	return walk	T6	Amber
Common Gull	> 100 m overflying	T1 and T2 T2	Amber
Coal Tit	> 100 m	T6	Green
Skylark	return walk	T5	Amber
Grey Wagtail	overflying	T1	Red

BoCCI = Birds of Conservation Concern Ireland listings (Colhoun and Cummins, 2013).



Text Figure 1. Relationship between the total number of bird species recorded and the transect length for the 2014/15 and 2015/16 datasets (2014/15 and 2015/16). The graph also shows the data for T1 and T4 excluding wetland species (2014/15* and 2015/16*).

2.3. CONCLUSIONS

The bird species recorded on the transect counts represent a typical bird assemblage for lowland agricultural habitats in southern Ireland. While a number of red and amber-listed species were recorded, apart from the waterbird species in Lough Beg, none of these represent populations of specific conservation importance that require site-specific conservation measures.

3. FIELD FEEDING WADER SURVEY

3.1. INTRODUCTION

The field feeding wader survey was carried out on six dates between October 2015 and March 2016. The survey covered seven count areas along the eastern end of the proposed route corridor, and around Lough Beg. On each count day, two complete surveys of the count areas were carried out: one at high tide, and one on the ebb/flood tide. In addition, dusk counts were carried out at Lough Beg. Additional searches of the remainder of the route corridor were carried out on three of the count days, and during each of the transect counts.

3.2. METHODOLOGY

3.2.1. Count areas

The survey covered the six count areas defined in the map on page 14 of the Glas Ecology report. These count areas include four areas of fields (CA1 and CA4-CA6), as well as the lagoon and intertidal habitat at Lough Beg (CA2 and CA3). An additional count area (CA7) was also defined, covering the outer part of Lough Beg and the shoreline around Lough More. Inclusion of CA2, CA3 and CA7 allowed the number of birds using the fields to be compared to the numbers using the intertidal and lagoon habitats. Descriptions of the count areas are provided in Table 4.

Table 4 Count areas used for the field feeding survey.

Count area	Type	Description
CA1	Fields	Large fields of improved grassland, mainly lacking field boundary vegetation, on the hillside above the western side of Lough Beg. Additional fields to the south were also covered (CA1*).
CA2	Wetland	Tidal lagoon and brackish marsh.
CA3	Intertidal	The main area of intertidal habitat in Lough Beg, which consists of large areas of intertidal mudflat, as well as areas of <i>Spartina</i> -dominated saltmarsh along the western side of the CA, and narrow strips of shingle and littoral rock around the shoreline.
CA4	Fields	An area of small fields of improved grassland, with three maize fields in the south-eastern corner, divided by hedgerows.
CA5	Fields	Two large fields of improved grassland on a hillside rising up to the Martello Tower. Two additional fields to the east were also covered (CA5*)
CA6	Fields	A large CA extending along the proposed route from Castlewarren to Shanbally. Contains several large fields of improved grassland, although the fields to the south of the Janssen access road are less intensively managed and probably best described as semi-improved. The CA, as defined in the Glas Ecology report, also includes arable fields, a section of the landscaped grounds around the Novartis factory, and a quarry. Several additional fields to the east, south and west were also covered (CA6*).
CA7	Intertidal	The coastline around Lough More and the outer part of Lough Beg. This mainly consists of narrow strips of littoral rock, with areas of sandy shoreline at Lough More and to the south of the GSK factory.

See Figure 2 for boundaries of the count areas and other details.

The boundaries of count areas CA1-CA6 were based on the map on page 14 of the Glas Ecology report, but were redrawn on aerial imagery to follow defined field boundaries (Figure 2). Some additional areas of fields adjacent to these count areas were also surveyed (labelled CA1*, CA5* and CA6* in Figure 2).

The field count areas (CA1 and CA4-CA6) were mainly surveyed by driving along bordering roads and stopping as required to scan the fields. However, CA4 was surveyed by walking up to the Martello tower, as the upper slopes of the fields in this count area were not visible from the adjacent roads (Figure 2). Similarly, in CA6, two section of fields had to be surveyed by walking the fields due to limited visibility from the adjacent roads (Figure 2). During the high tide and ebb/flood tide counts, the wetland/intertidal count areas (CA2-CA3 and CA7) were surveyed from a series of

shoreline vantage points (Figure 2). The dusk counts of Lough Beg (CA3) were carried out from a single vantage point (Figure 2), which covered the main Curlew nocturnal roost.

3.2.2. High tide and ebb/flood tide counts

On each count day, two complete surveys of the count areas were carried out: one at high tide (during the three hour period centred on high tide), and one on the ebb/flood tide (outside the three hour period centred on high tide, when mudflats were exposed in Lough Beg). The purpose of carrying out two sets of counts was to test whether the occurrence of field feeding waders was related to the tidal cycle: i.e., were birds feeding on mudflats at low tide and moving to fields at high tide? Apart from the first survey day, the counts of the field count areas (CA1, and CA4-CA6) were started/finished at least 90 minutes after dawn/before dusk, as field feeding waders in Cork Harbour are known to roost in estuarine areas at night. On the first survey day, the ebb tide count overran and did not finish until one hour before dusk.

The timings of the high tide and ebb/flood tide counts are shown in Table 5. On some days, it was necessary to split the ebb/flood tide counts into periods before and after the high tide counts. However, when this was the case, coverage of individual count areas were not split between these periods. The weather conditions during the high tide and ebb/flood tide counts are shown in Table 6. While periods of windy and/or rainy weather occurred on some of the counts, the weather conditions never affected bird detectability (as the field feeding counts are entirely based on visual observation, the weather constraints for carrying out the counts are less stringent than those required for the transect counts).

The target species for the high tide and ebb/flood tide counts were the following wader species that feed on fields in the Cork Harbour area: Oystercatcher, Golden Plover, Lapwing, Black-tailed Godwit and Curlew. In addition any other waterbird species encountered in the field count areas (CA1 and CA4-CA6) were also recorded. Only the target species were counted in the lagoon/intertidal count areas (CA2-CA3 and CA7) due to the time limitations.

For each observation, the bird behaviour was classified as feeding, flying, flushed, or roosting/other. The flushed category distinguishes birds that had been settled in the count area but flushed before their behaviour could be observed, as opposed to birds that were only observed overflying the count area. The roosting/other category includes all non-feeding behaviour of birds that were observed on the ground. For most observations, the locations of the birds, and or their flight paths, were recorded on maps. The exceptions were dispersed birds in intertidal areas.

Table 5 Timing of the high tide and ebb/flood tide counts.

Date	High tide		High tide counts		Ebb/flood tide counts	
	time	height (m)	start time	finish time	start time	finish time
04/11/2015	11:14	3.4	09:48	12:53	13:20	16:37
20/11/2015	11:42	3.6	10:29	12:56	09:26 13:55	10:01 16:15
22/12/2015	14:38	3.9	13:10	15:40	10:20	12:12
05/01/2016	12:39	3.4	11:15	14:09	09:43 14:18	11:09 15:09
03/02/2016	12:41	3.1	11:53	14:18	09:08	11:03
03/03/2016	11:50	3.2	10:20	12:59	13:17	15:53

20/11/2015: CA6 counted on flood tide; other CAs counted on ebb tide.

05/01/2016: CA6 counted on ebb tide; other CAs counted on flood tide.

Table 6 Weather conditions during, the field feeding counts, 2015/16.

Transect	High tide counts				Ebb/flood tide counts			
	Cloud	Wind	Rain	Visibility	Cloud	Wind	Rain	Visibility
04/11/2015	3	no wind	1	1	3	no wind/SE2	1	1
20/11/2015	2	W4	1-2	1	2-3	W4-5	1-2	1
22/12/2015	2-3	SW4	1-2	1	3	SW4-5	1	1
05/01/2016	2-3	NW4	1	1	2-3	NW3-4	1	1
03/02/2016	2-3	W3-4	1	1	1-2	W2-4	1	1
03/03/2016	3	S3	3	2	3	S3/SW2	1-2	1

Cloud cover: 1 = 0-33%, 2 = 34-66%, 3 = 67-100%.

Wind: compass direction and Beaufort scale.

Rain: 1 = on rain; 2 = showers; 3 = drizzle.

Visibility: 1 = good; 2 = moderate.

3.2.3. Dusk counts

In addition to the two complete surveys of the count areas, on each count day (apart from the first count day) counts were also carried out of waders in Lough Beg (CA3) at dusk to record the numbers of roosting field feeding waders. An additional dusk count was also carried out after completion of the transect surveys on 29/01/2016.

These counts were started at least 40 minutes before dusk, and were continued until dusk. An initial count of all the target species was carried out (using the same methodology as for the ebb/flood tide counts). Repeat counts were then carried out until it was too dark to accurately count birds in the *Spartina* (where the main Curlew roost occurred). The watch was then continued until dusk to record any new birds arriving at the roost. The repeat counts, and roost watch, focused on Curlew because there was no evidence of any of the other target species using Lough Beg as a nocturnal roost. The final count was derived by summing the totals of the latest accurate count and any subsequent arrivals.

On the first count day, the ebb/flood tide count overran into the dusk period. Therefore, the ebb/flood tide count for CA3, combined with observations of flock movements from CA7, provides an indication of the roosting numbers, but may be an underestimate.

In the results, the numbers of Curlew considered to be field feeding birds flying into Lough Beg to roost are distinguished from birds considered to be part of the intertidally feeding population (i.e., present in Lough Beg throughout the day). On most count days, this was an easy distinction to make as the dusk fell during the latter part of the ebb tide period, or during low tide, and there were extensive areas of mudflat exposed, which the intertidally feeding birds were dispersed across. In these situations, dispersed roosting birds out on the mudflats were taken to be part of the intertidally feeding population. On 22/11/2015, the dusk count period fell at the start of the ebb tide and the mudflats were still largely flooded. However, the intertidally feeding Curlew continued to occupy roosts along the eastern shoreline of Lough Beg (which they had occupied at high tide), while the presumed field feeding birds flew into the *Spartina* roost, allowing the two groups to be distinguished.

The timings of, and weather conditions during, the dusk counts are shown in Table 7.

Table 7 Timing of, and weather conditions during, the dusk counts, 2015/16.

Date	Start time	Dusk	Cloud	Wind	Rain	Visibility
20/11/2015	16:34	17:15	3	W5	2	2
22/12/2015	15:55	17:06	2	SW4	2	2
05/01/2016	16:00	17:18	2	NW4	1	2
29/01/2016	16:53	17:53	3	SW4	2	1
03/02/2016	17:03	18:03	3	W4	1	1
03/03/2016	16:54	18:52	2	W4	1	1

Cloud cover: 1 = 0-33%, 2 = 34-66%, 3 = 67-100%.

Wind: compass direction and Beaufort scale.

Rain: 1 = on rain; 2 = showers; 3 = drizzle.

Visibility: 1 = good; 2 = moderate (note visibility refers to conditions at the start of the count, before the fading light started to have major effects).

3.2.4. Additional searches

Searches of the remainder of the route corridor (i.e., west of CA6) for field feeding waders were carried out on 04/11/2015 (between the high tide and ebb tide counts), 03/02/2016 (between the high tide and dusk counts) and 03/03/2016 (before the high tide count). Searches were also made during the transect counts (while walking the transects and while moving between the transects). Searches were not made on three of the field feeding count days (20/11/2015, 22/12/2015 and 05/01/2016) due to lack of time resulting from the short day length on these days.

The searches were all carried out at least 1.5 hours after dawn/before dusk, when field feeding waders should be active. The searches were made by driving the route and stopping frequently to scan fields from suitable vantage points. Apart from on the transect count days, no fields were walked so some areas will not have been visible. However, I consider that the searches covered the vast majority of potential field feeding habitat along the route corridor.

3.3. RESULTS

3.3.1. Curlew field feeding

Field feeding Curlew were recorded on all the count days, and on all but one of the counts (Table 8). On the one exception (the ebb tide count on 04/11/2015), the main field feeding count area (CA1) was counted between 01:20 and 01:27 hours before dusk and, by this time, the field feeding birds may already have gone to roost.

In the November, February and March counts the field feeding birds occurred mainly in CA1, while in the December and January counts, the field feeding birds occurred mainly in CA6. Smaller flocks were recorded in fields to the east of CA5 on three of the counts (and may have occurred there more regularly; see discussion). On 03/03/2016, the flock from CA5 flew to CA4 and briefly settled before being presumed to have flown on and joined the birds in CA1.

During the transect counts (which included transects covering CA4 and part of CA6), the only records of field feeding birds were of single Curlew in a maize field in CA4 on 11/12/2016, and flying south-west across CA4 (from CA5) on 29/01/2016. No field feeding Curlew were recorded anywhere else along the route corridor during the general searches of the route corridor made on the three transect counts and on 04/11/2015, 03/02/2016 and 03/03/2016.

The field feeding Curlew flocks in CA1 were widely distributed but mainly occurred along the lower slopes adjacent to CA2 and CA3 (Figure 3). In CA6, the field feeding Curlew flocks mainly occurred along the top of the ridge to the east of Castlewarren, with one record from the eastern end of the fields to the south of the Janssen access road at Barnahely (Figure 3).

Table 8 Numbers of field feeding Curlew recorded during high tide (HT) and ebb/flood tide (E/F) counts during the field feeding survey, 2015/16.

Count area	04/11/2015		20/11/2015		22/12/2015		05/01/2016		03/02/2016		03/03/2016	
	HT	E/F	HT	E/F	HT	E/F	HT	E/F	HT	E/F	HT	E/F
CA1	43	0	41	43	1	1	0	0	76	19	32*	64
CA4	0	0	0	0	0	0	0	1	0	0	0	19
CA5	14**	0	0	6*	0	0	0	3	28*	0	5*	19*
CA6	0	0	0	0	51	39	46	41*	0	0	0	0
Total	57	0	41	47	52	39	46	45	76***	19	37	83***

* recorded in fields adjacent to, but outside, the count area, or flying from those fields (i.e., areas labelled as CA1*, CA5* or CA6* in Figure 2).

** 2 birds in CA5 and 12 birds in CA5*.

** totals excludes birds considered to be duplicate counts.

3.3.2. Overall pattern of Curlew occurrence in the Lough Beg area

Field feeding Curlew in the Cork Harbour area feed on fields during the day and roost in estuarine areas at night. These nocturnal roosts use traditional roosting sites (often the same as high tide roosts). The Curlew that use intertidal habitat in Cork Harbour for feeding appear to show a different diel pattern of activity, feeding at low tide and roosting at high tide. While the nocturnal activity of these birds has not been directly observed, when low tide occurs around dawn or dusk, repeat counts of Curlew feeding in intertidal habitat show no evidence of birds leaving roosts at dawn, or going to roost at dusk.

At any one point during the period of exposure of intertidal habitat some of the intertidally feeding Curlew will be roosting. However, these birds usually roost individually out in the middle of the intertidal zone. Therefore, at dawn/dusk, these birds can usually be distinguished from the field feeding Curlew that come to the estuarine areas to roost in discrete communal roosts. However, it is possible that some intertidally feeding Curlew that choose to roost at dusk could join the communal roosts of the field feeding birds (it would be difficult to detect such behaviour by direct observation).

In the Lough Beg area, most/all field feeding Curlew roosted nocturnally in/along the edge of the *Spartina* at the western side of Lough Beg (Figure 2). On some count days, a pre-roost gathering was observed on the mudflats in the outer part of Lough Beg, with these birds then moving to the *Spartina* roost. The dusk counts recorded the numbers of Curlew using these roosts, as well as the numbers of intertidally feeding Curlew present at dusk. The results of these dusk counts, combined with the results of the daytime high tide and ebb/flood tide counts, are presented in Table 9. These counts show that the numbers of the intertidally feeding birds normally remained fairly constant across the day. The exceptions were on 22/12/2016, when there were very low numbers on the flood tide, and on 03/02/2016, when much larger numbers occurred at high tide compared to on the flood tide and at dusk. There is no evidence from the count data of intertidally feeding Curlew leaving Lough Beg at high tide to feed on fields. The numbers of nocturnally roosting birds were always significantly higher than the numbers of field feeding birds recorded during the day in CA1 and CA4-CA6, indicating that field feeding birds from further afield were commuting to Lough Beg to roost at night. Direct observations supported the latter conclusion: flocks of Curlew were observed flying into Lough Beg from beyond Currabinny around 30-60 minutes before dusk on four of the six count days, as well as during the additional dusk count on 29/01/2016 (Table 10); on 21/11/2015 (one of the two count days when this movement was not observed), the dusk count may have started too late to have detected the movement. These birds were presumably field feeding birds coming from fields above Crosshaven.

Table 9 Overall numbers of Curlew recorded during high tide, ebb/flood tide and dusk counts.

Date	Count	Intertidally feeding birds	Field feeding birds	Nocturnally roosting birds	Total
04/11/2015	High tide	46	57	0	103
	Ebb tide/dusk	46	0	129	175
20/11/2015	High tide	50	41	0	91
	Ebb tide	65	49	0	114
	Dusk	45	0	112	157
22/12/2015	Flood tide	14	40	0	54
	High tide	62	52	0	114
	Dusk	72	0	171	243
05/01/2016	Flood tide	35	45	0	80
	High tide	42	46	0	88
	Dusk	28	0	201	229
29/01/2016	Dusk	20	0	163	183
03/02/2016	Flood tide	23	19	0	42
	High tide	107	76	0	183
	Dusk	39	0	108	147
03/03/2016	High tide	33	37	0	70
	Ebb tide	27	83	0	110
	Dusk	16	0	163	179

Intertidally feeding birds include birds that were roosting at the time of the count, but, from their behavior, are considered to belong to the intertidally feeding population (see text).

Table 10 Observations of Curlew movements into Lough Beg from beyond Currabinny near dusk.

Date	Time	Dusk	Flock size
04/11/2015	16:34	17:37	70
22/12/2015	16:28	17:06	120
05/01/2015	16:25	17:18	45
29/01/2016	16:53	17:53	70
03/03/2016	18:15	18:52	10

3.3.3. Other species

Apart from Curlew, eight other waterbird species were recorded during the field feeding counts in CA4-CA6 (and adjacent fields) (Table 11).

Sizeable flocks of Black-headed Gull and Common Gull occurred regularly, mainly in CA1 and/or CA6 and adjacent fields. There were occasional records of other gull species (Mediterranean Gull and Lesser Black-backed Gull) associated with these flocks. During dusk watches at Lough Beg, large numbers of Black-headed Gull and Common Gull were recorded flying south into Lough Beg, where they would settle on intertidal habitat, or in subtidal water, at the mouth of the lough before flying on to roost in open waters between Fort Camden and Spike Island.

Small numbers of Little Egret and Snipe also occurred regularly. The Little Egret mainly occurred in CA6 (particularly around Castlewarren). Snipe were only recorded from CA5, but this was because Snipe were only detected when they were flushed and CA5 was the only count area where extensive areas of fields were walked. Oystercatcher and Black-tailed Godwit (which regularly feed on fields in other areas around Cork Harbour) were only recorded field feeding occasionally and in small numbers in this survey. The Oystercatcher flock on 04/11/2015 was recorded in the fields to the east of CA5, while the Black-tailed Godwit flock on 03/02/2016 was recorded in the north-eastern part of CA1.

Table 11 Numbers of field feeding waterbirds (excluding Curlew) recorded during high tide (HT) and ebb/flood tide (E/F) counts during the field feeding survey, 2015/16.

Species	04/11/2015		20/11/2015		22/12/2015		05/01/2016		03/02/2016		03/03/2016	
	HT	E/F	HT	E/F	HT	E/F	HT	E/F	HT	E/F	HT	E/F
Little Egret	0	0	1	1	8	1	0	3	2	1	0	0
Oystercatcher	34	0	3	0	0	0	0	0	0	0	0	0
Snipe	2	2	0	0	0	2	0	3	2	2	2	0
Black-tailed Godwit	1	0	0	0	0	0	0	0	26	0	0	0
Black-headed Gull	0	26	14	48	75	0	0	99	26	83	17	16
Common Gull	0	3	32	48	131	0	0	163	43	118	0	97
Mediterranean Gull	0	0	0	0	1	0	1	0	1	0	0	1
Lesser Black-backed Gull	0	0	0	1	0	0	0	0	0	0	0	0

3.4. DISCUSSION

3.4.1. Introduction

This section reviews the patterns of field feeding behaviour observed in this study, and compares the results with the 2014/15 Glas Ecology surveys, as well as other previous studies/observations from the Lough Beg area. The latter include:

- Atkins - surveys of fields around the Martello Tower (including CA5, CA5* and fields to the east) carried out by Atkins on behalf of Cork County Council in 2014/15. These surveys also included some coverage of CA1 and CA4. The results cited from the Atkins surveys are based on personal communications from Paul O'Donoghue and John Deasy.
- FERA - combined radar and vantage point surveys covering the Lough Beg, Monkstown Creek and Owenboy Estuary areas, carried out by FERA in 2010/11 for the Cork Lower Harbour Wind Turbine Development project (Simms et al., 2011a, b).
- NEC - counts, and vantage point watches, of the Lough Beg and Monkstown Creek area carried out by Natura Environmental Consultants in 2009/10 for the Cork Lower Harbour Wind Turbine Development project (DePuy, 2011; Janssen, 2011; Novartis, 2011; SKB, 2011).
- TCK - comments from the Irish Wetland Bird Survey counter for the Lough Beg I-WeBS subsite (Dr T.C. Kelly, pers. comm.)

3.4.2. Curlew field feeding in the Lough Beg area

This study found that field feeding by Curlew occurred regularly in the Lough Beg area, including in the vicinity of the eastern end of the route corridor between Castlewarren and Ringaskiddy.

The most frequently used area was CA1, on the western side of Lough Beg. This was also the most frequently used area in the 2014/15 Glas Ecology survey. Field feeding by Curlew in this area has also been reported by other observers:

- In 2014/15, field feeding in this area was regularly observed during the Atkins survey work.
- In 2010/11, Curlew field feeding appears to have been regularly observed in the southern part of CA1 (area F in Figure 5 of Simms et al., 2011b) during the FERA survey work (although the report is not very clear about the locations of field feeding areas).
- In 2009/10, Curlew were recorded in "agricultural fields immediately west and south west of Lough Beg Estuary ... every month during the winter period except for September 2009, with the largest number recorded being 127" (NEC survey).
- The I-WeBS counter for the Lough Beg subsite (TCK) has stated that Curlew "use the very large fields which can be seen from the hide to the west of the marsh ... and ... the fields on both sides of the road leading down to the causeway".

Curlew also occurred regularly in/adjacent to CA5. The larger flocks recorded in this area were all either in the far corner of the field east of the Martello Tower, or birds flying over which were presumed to have come from the next field to the east. In the 2014/15 Glas Ecology survey, Curlew were only recorded once in CA5 (a flock of 42), but this survey did not include the fields to the east of the Martello Tower. 25 Curlew were also recorded in CA5 in February 2014 during the Glas Ecology transect surveys. In the Atkins 2014/15 survey, which included all the fields in this area, Curlew flocks were regularly observed in this area, with a mean count of 11, and a maximum count of 21. The flocks mainly occurred in the far corner of the field east of the Martello Tower (the same location as observed in the present study), or in the fields to the east. Therefore, the results of the present study are consistent with the results of the Atkins survey and indicate that the fields to the east of the Martello Tower regularly hold small flocks of Curlew.

Curlew were recorded in CA4 on two dates during the 2015/16 field feeding survey, with an additional record from one of the transect counts. These records included one record of a flock of 19 birds, which involved a flock that briefly stopped in this area while moving between CA5 and CA1. The other two records were of single individuals. In the 2014/15 Glas Ecology survey, small flocks (< 10 birds) of Curlew were recorded twice in this area, while a flock of 31 was recorded here in February 2014 during the Glas Ecology transect surveys. In the 2014/15 Atkins survey small numbers of foraging Curlew were recorded in these fields, with a maximum count of 20 “but more usually 2-5 birds, if present at all”. There are no records from this area mentioned in any of the reports from the wind turbine studies. Therefore, the overall picture indicates that CA4 is occasionally used by very small numbers of Curlew, with rare records of larger flocks.

Flocks of 41-51 Curlew were recorded in/adjacent to CA6 on two dates during the 2015/16 field feeding survey. On both occasions, the birds occurred in fields around Castlewarren. The favoured area appeared to be the fields on top of the ridge east of the beet field. Large flocks of gulls also occurred in this area. These records came from the period of very wet weather in late December/early January and it may be that the weather conditions had caused a temporary abundance of available prey. There were no records of Curlew from CA6 during the 2014/15 Glas Ecology survey, and this area was not covered by the Atkins surveys. There are, however, some indications of field feeding by Curlew in this area from the wind turbine studies. Figure 15 in Simms et al. (2011) shows wader foraging areas located in the fields to the south of the Janssen access road, the arable field east of the Novartis site, and the grassland fields to the west of the Moog site. The Janssen EIS (Janssen, 2011) refers to the following information from an interim report (Simms, 2011a): “Curlew were recorded feeding on the managed grassland mounds around the Janssen facility and in the improved grassland fields further south, which are grazed by cattle”¹. Overall, the available information indicates that Curlew usage of CA6 is irregular/occasional, but sizeable numbers can occur.

There were no records of field feeding Curlew from other areas along the route corridor during the 2015/16 surveys, or during the Glas Ecology surveys. However, the Glas Ecology report states that “reports of Curlew using the area around Ballinimlagh were received from surveyors undertaking habitat survey work for this proposed scheme and 35 birds were seen flying over this area in November”.

3.4.3. Overall pattern of Curlew occurrence in the Lough Beg area

The results of the 2015/16 surveys show that Curlew field feeding in the Lough Beg area follows a diel cycle, rather than a tidal cycle. Birds feed on fields during the day and roost in intertidal areas in Lough Beg at night. The numbers of birds using the nocturnal roost was always significantly higher than the numbers recorded field feeding in the Lough Beg area during the day, indicating that birds using the roost range over a wider area. This is supported by the regular occurrence of a flightline of birds coming into the mouth of Lough Beg, presumably from the Crosshaven

¹ The Novartis EIS (Novartis, 2011) also makes reference to information from this interim report, indicating usage of additional areas: “Curlew were recorded feeding on the managed grassland mounds around the Novartis facility and in the improved grassland fields further south, which are grazed by cattle”. However, due to the identical wording, this is presumed to be a misquote of the information quoted in the Janssen EIS.

direction. Birds feeding in intertidal habitat follow a tidal cycle, feeding at low tide and roosting at high tide. Over short timescales, there appears to be little interchange of individuals between the field feeding and intertidally feeding groups of birds: I did not observe any birds move between fields and intertidal areas, or vice versa, during the day. This pattern of behaviour is consistent with my observations of Curlew behaviour elsewhere in Cork Harbour.

Similar patterns of behaviour were also observed during the FERA surveys (Simms et al., 2011b). The field feeding birds were observed to roost nocturnally in the “saltmarsh at the western end of Lough Beg” (the same location as observed in the present study), with the exception of nocturnal spring high tides when the birds were “were pushed out” and “the roost moved to the brackish marsh in Lough Beg”. In 2015/16, high water levels in the lagoon deterred waders from roosting there during daytime high tides, but the timing of my surveys (with high tides during the middle of the day) meant that I did not observe what the Curlew did when their nocturnal roost was flooded by spring high tides. The FERA surveys also recorded a flightline of birds entering Lough Beg “through the mouth of the estuary from feeding sites elsewhere in Cork Harbour”, which is presumably the same as the flightline recorded in 2015/16 of birds presumed to be coming from the Crosshaven direction. Another flightline was recorded by the FERA surveys of birds leaving/returning to/from the north/north-east. This presumably included birds feeding in the fields to the east of CA5, as well as possibly other locations (the average count was around 50, which is higher than the numbers using the latter area in 2014/15 and 2015/16).

The overall numbers of Curlew recorded in the FERA surveys (Simms et al., 2011b) in 2010/11 appear to have been much higher than those recorded in the present study, with monthly peaks of 220 in November, 680 in December, 420 in January, 410 in February and 82 in March. Although it is not clear exactly what area these peak counts refer to, the text indicates that (apart from in December and March) the majority of birds were field feeding, while the December peak is explicitly stated to refer to the Lough Beg nocturnal roost.

3.4.4. Other field feeding wader species

The other species of wader that commonly feed in large flocks on fields in the Cork Harbour area were not recorded (Golden Plover and Lapwing), or only recorded rarely (Oystercatcher and Black-tailed Godwit) during the 2015/16 survey. Some of these species have been recorded field feeding more frequently in the Lough Beg area in previous winters.

Oystercatcher were regularly recorded field feeding in the fields to the east of CA5 by Atkins in 2014/15 (mean count of 12, maximum count of 31). These birds mainly occurred in the same areas as the Curlew, and were noted to fly over the cliff onto the adjacent rocky shoreline when disturbed. In 2015/16, the lack of survey of the easternmost of the fields to the east of CA5 may, at least partly, explain the rarity of Oystercatcher records from this area. There are few records of Oystercatcher field feeding elsewhere in the Lough Beg area: there was one record of 5 birds in CA4 from the 2014/15 Glas Ecology surveys, while two birds were recorded feeding in fields north-west of Lough Beg (probably in CA6) in the 2010/11 FERA surveys.

Black-tailed Godwit have been noted by several studies/observers (Atkins; FERA; NEC; TCK) to regularly feed in CA1, although there was only a single record from this area in the 2014/15 Glas Ecology survey. The very wet weather in the winter of 2015/16 may have caused dispersal of birds away from Cork Harbour to feed in flooded fields inland: for example, there was a flock of around 800 Black-tailed Godwit feeding on the Lee Fields for several weeks around Christmas 2015. There do not appear to be any records of Black-tailed Godwit feeding in fields elsewhere in the Lough Beg area.

Irish Wetland Bird Survey (I-WeBS) data indicate that Golden Plover and Lapwing are rare in the Lough Beg area, although Lapwing occur more frequently (but in low numbers) on the Owenboy Estuary. The FERA surveys recorded a flock of around 35 Lapwing feeding in CA5 for a few days in November 2010, while the NEC surveys recorded a flock of 100 Golden Plover on one occasion in CA1. There do not appear to be any other records of Golden Plover or Lapwing field feeding in the Lough Beg area, indicating that it is an occasional, or rare, occurrence.

Overall, it seems that the only regular field feeding sites for waders (other than Curlew) in the Lough Beg area are the fields to the east of CA5 for Oystercatcher and CA1 for Black-tailed Godwit.

3.4.5. Other species

The other waterbird species recorded in fields during the 2015/16 field feeding survey were Little Egret, Snipe, Black-headed Gull, Common Gull, Mediterranean Gull and Lesser Black-backed Gull. The occurrence patterns of these species in the fields around the Lough Beg are typical of their occurrence patterns in fields around Cork Harbour.

In the 2014/15 Glas Ecology field feeding survey, Shelduck and Redshank were also recorded on fields in CA1. In the Cork Harbour area, these species typically only occur on fields that are immediately adjacent to estuarine areas, and have unrestricted access to the estuarine areas (e.g., at Slatty Pool, near Carrigtwohill), although Redshank may also visit flooded fields further away from estuarine areas. The occurrence of these species in CA1 is, therefore, not surprising but they are unlikely to use fields in any of the other count areas.

4. GLOUNTHAUNE ESTUARY/SLATTY WATER

4.1. INTRODUCTION

As part of the consultation process for the M28 upgrade scheme, NPWS raised a concern about the potential for road schemes to fragment feeding habitat and deter Curlew from flying over roads to reach feeding areas. In response to this concern, the work carried out in 2014/15 by Glas Ecology included some surveys of field feeding waders in fields on the eastern side of Little Island adjacent to the N25 dual carriageway.

The Glounthaune Estuary/Slatty Water is the estuarine area adjacent to the northern side of Little Island. I have counted this area for the Irish Wetland Bird Survey (I-WeBS) since 1995, and have also carried out many other non-I-WeBS counts of this area. As part of my counts, I routinely record numbers of waders feeding in several areas of fields adjacent to the estuary. Therefore, I have a long-term dataset on patterns of field feeding behaviour in this area of Cork Harbour. For the present study, I have used this dataset to analyse the usage of different areas of fields by Curlew.

4.2. COUNT SECTORS

The counts of Glounthaune Estuary/Slatty Water in the dataset are divided into 19 sectors. These sectors subdivide the overall subsite. Six of these sectors represent areas of fields that are used by field feeding waders (Figure 4; Table 12). Each of these sectors comprise a block of fields lacking significant internal divisions. All six sectors mainly comprised intensively managed improved grassland. However, there have been land management changes in two of these sectors (HN and LIWF) in recent years, while a section of LIEF was under arable crops in the early/mid-2000s (Table 12). Three sectors are immediately adjacent to the N25 dual carriageway (HN, LIEF and LIWF), while the other three (SF, SP and WIF) are around 0.5-1.5 km from the dual carriageway (but SP is adjacent to the busy R624 road) (Figure 4). A nocturnal Curlew roost occurs in Slatty Water. This roost uses a saltmarsh island to the north of the dual carriageway at high tide, and an area of mudflat to the south of the dual carriageway at high tide (Figure 4).

Table 12 Sectors of the Glounthaune Estuary/Slatty Water with field feeding habitat.

Code	Sector	Area (ha) of grassland	Description
HN	Harper's North	11.8 (8.9 after 2006)	Low-lying fields on the northern side of Harper's Island. These fields were improved grassland grazed by sheep until the summer of 2006. Since then, the fields have not been managed intensively and now regularly flood in winter. Part of the fields (HN1) have now developed into <i>Salicornia</i> -dominated saltmarsh, while the remainder (HN2) are rough grassland grazed by horses. Since 2006, counts may include birds feeding or roosting in the <i>Salicornia</i> zone, but these birds are counted separately from the birds feeding in the remaining fields and have not been included in the dataset analysed in this report.
LIEF	Little Island East fields	19.7 (11.8 in the early/mid-2000s)	Large fields of improved grassland on the eastern side of Little Island. These are mainly on sloping ground, but include a small section of low-lying fields, which can flood, around a small tidal inlet. A section of the fields were under arable crops for several years in the early/mid-2000s.
LIWF	Little Island West fields	16.5	Two low-lying fields on the northern side of Little Island, adjacent to the western end of the Glounthaune Estuary. These fields were intensively managed as improved grassland but appear to have been somewhat neglected in recent winters. However, these fields have not been routinely counted since the winter of 2005/06, due to the growth of vegetation along the N25 (which have obscured the fields from the vantage points previously used).
SF	Slatty fields	13.7	Low-lying fields of improved grassland to the south-east of Slatty Pool. Parts of these fields occasionally flood.

Code	Sector	Area (ha) of grassland	Description
SP	Slatty Pool	9.1	Slatty Pool is a lagoon formed by the impoundment of the upper end of Slatty Water. The Slatty Pool count sector includes the lagoon and fields of improved grassland to the south of the pool. These fields include low-lying sections along the edge of the pool, which can flood, and areas of higher ground to the south. Counts from this sector may include birds roosting along the edge of the pool, but these birds are counted separately from the birds feeding in the fields and have not been included in the dataset analysed in this report.
WIF	Weir Island fields	22.2	Fields of improved grassland between the inlet at Rossmore and the fields to the north. These fields have been used for licensed waste deposition, which has raised the level of the fields. However, the majority of the sector has remained as improved grassland throughout the period covered by this analysis.

See Figure 4 for sector boundaries and other details.

4.3. DATA ANALYSIS AND RESULTS

The analyses in this report use count data from the winters (September-March) of 2001/02-2015/16. A total of 91 counts were included in this dataset, and field feeding Curlew were recorded on 76 of these counts.

Field feeding Curlew showed a strongly seasonal pattern of occurrence: during the November-February period, they occurred on 86% of the counts, with a median number per count of 12-16 birds, while in September-October and March they only occurred on 53% of the counts with a median number per count of 0-1 birds (Table 13).

Table 13 Summary of seasonal pattern of occurrence of field feeding Curlew around Glounthaune Estuary/Slatty Water, 2001/02-2105/16.

Month	Number of counts	Field feeding Curlew numbers:		
		median count	maximum count	% non-zero counts
September	13	1	12	54%
October	13	1	22	69%
November	12	12	53	92%
December	14	8	92	71%
January	16	14	157	88%
February	15	14	111	93%
March	8	0	8	25%

The occurrence of field feeding Curlew in individual count sectors was analysed across two periods: 2001/02-2005/06 and 2006/07-2015/16. During 2001/02-2005/06, the LIWF sector was counted, and the HN sector was intensively grazed by sheep and was not subject to tidal flooding. Also, for some, or all, of this period part of the LIEF sector was under arable crops. From 2006/07, the LIWF sector was not counted, intensive grazing of the HN sector ceased and it was subject to tidal flooding, and all of the LIEF sector was under improved grassland.

Compared to the pattern of field feeding in the Lough Beg area, there does not appear to be a single strongly preferred area for field feeding in the Glounthaune Estuary/Slatty Water area (Table 14). During 2001/02-2005/06, the HN, LIWF and WIF sectors were the most frequently used by field feeding Curlew, and supported the largest numbers. The mean count for the SF sector was also high, but this was due to a single large count of 77 birds. From 2006/07, the frequency of usage of the HN sector decreased (from 62% to 26% of the counts), possibly reflecting the changes in management which reduced the area of grassland, and produced a rougher sward. The frequency of usage of the LIEF sector increased (from 23% to 37% of the counts), possibly reflecting the increased area of improved grassland, following the cessation of grazing. The frequency of usage of the WIF sector was similar between the two periods.

Table 14 Summary of Curlew field feeding records in Glounthaune Estuary/Slatty Water count sectors, 2001/02-2005/06 and 2006/07-2015/16.

Sector	Area (ha)	2001/02-2005/06 (n= 26 counts)			2006/07-2015/16 (n = 46 counts)		
		number of records:		mean count	number of records:		mean count
		all flocks	>9 birds		all flocks	>9 birds	
HN	11.8/8.9	16	5	12	12	3	12
LIEF	11.8/19.7	6	2	8	17	13	26
LIWF	16.5	11	7	17	-	-	-
SF	13.7	5	2	22	6	1	5
SP	9.1	3	1	7	12	4	10
WIF	22.2	10	6	25	15	10	27

The mean count is the mean across counts where Curlew occurred (i.e., it excludes zero values).

In Table 15, the sectors are grouped by whether they are close to, or distant from, the N25 dual carriageway. During 2001/02-2005/06, the areas of the close and distant sector groups were very similar. During this period, field feeding Curlew occurred more frequently in the close sectors, but, when they did occur in the distant sectors numbers tended to be higher. The area of the close sector groups was lower in the 2006/07-2015/16 period due to the cessation of counting of the LIWF sector. However, both the frequency of occurrence, and the numbers occurring, were very similar between the two sector groups during this period.

Table 15 Comparison of the occurrence of field feeding Curlew in fields close to (near), and distant from (far), the N25 dual carriageway.

	Distance from N25	Area (ha)	Number of records:		Mean count
			all flocks	>9 birds	
2001/02-2005/06 (n= 26 counts)	close	40	24	12	17
	distant	45	13	8	30
2006/07-2015/16 (n = 46 counts)	close	29	28	15	20
	distant	45	29	15	19

The close group includes sectors HN, LIEF and (2001/02-2005/06 only) LIWF. The distant group includes sectors SF, SP and WIF. The area for the close group in 2001/02-2005/06 excludes the area of the arable fields in LIEF, while the area for the close group in 2006/07-2015/16 takes account of the reduction in area of field habitat in HN.

4.4. DISCUSSION

The analysis of my dataset on field feeding Curlew in the Glounthaune Estuary/Slatty Water subsite shows that Curlew routinely feed on fields immediately adjacent to the N25 dual carriageway, and found no evidence that fields further from the dual carriageway were preferred by Curlew.

There are, however, some limitations to the conclusions that can be drawn from this analysis. There are various additional factors that may affect Curlew usage of fields, which could, in theory, obscure any relationship that may exist between field usage and proximity to the dual carriageway. These additional may include the pasture quality, soil type, drainage, proximity to the nocturnal roost, and other disturbance sources. Furthermore, counts of the Slatty Water nocturnal roost indicate that the field areas included in the analysis only support a small proportion of the total field feeding Curlew population in the area. However, notwithstanding these limitations, the analysis does indicate that any disturbance/fragmentation impacts from road development will be of limited magnitude

5. IMPACT REVIEW

5.1. INTRODUCTION

Curlew is the only field feeding wader that occurs in significant numbers in field areas that overlap the proposed route. Therefore, this impact review is limited to consideration of potential impacts to Curlew.

5.2. NUMBERS OF BIRDS AFFECTED

The two count areas that would be affected by the proposed route are CA5 and CA6. The route would go through the middle of CA6 and skirt the edge of CA5. The areas regularly used by Curlew and Oystercatcher to the east of CA5 are over 500 m from the proposed route. Therefore, I have assumed that these areas will not be affected. The numbers of Curlew recorded in the 2014/15 and 2015/16 field feeding surveys within the areas of CA5 and CA6 potentially affected by the proposed route are shown in Table 15. The mean of the peak daily counts across the two seasons was 11.8. This indicates the maximum magnitude of the likely impact, assuming that the road development causes complete displacement of these birds (which is an extremely unlikely scenario; see below).

Table 16 Numbers of field feeding Curlew recorded in areas potentially affected by the proposed route of the M28 upgrade scheme.

Season	Date	CA5	CA6	Total
2014/15	31/10/2014	0	0	0
	28/11/2014	0	0	0
	22/12/2014	0	0	0
	12/01/2015	42	0	42
	13/02/2015	0	0	0
	19/03/2015	0	0	0
2015/16	04/11/2015	2	0	0
	20/11/2015	0	0	0
	22/12/2015	0	51	51
	05/01/2016	3	46	49
	03/02/2016	0	0	0
	03/03/2016	0	0	0

The 2015/16 data shows the maximum of the high tide and flood/ebb tide counts.

Displacement impacts to waterbirds are usually quantified as percentages of the overall size of the relevant population. The Cork Harbour Curlew population is monitored by counts carried out for the Irish Wetland Bird Survey (I-WeBS). The Curlew counts for the most recent four winters available are shown in Table 17². The peak counts occur in September/October, with lower numbers in mid-winter. However, the coverage of field feeding birds by the I-WeBS counts is limited. They may be counted where they occur in fields adjacent to I-WeBS subsites, but many will be missed. Therefore, it is not clear whether the autumn peak is due to passage birds passing through, field feeding birds being missed during mid-winter, or a combination of these factors.

The mean November-February Cork Harbour Curlew count is 865. A major nocturnal Curlew roost occurs in Slatty Water, where an additional 100-800 birds can be present, compared to the numbers counted in the Glounthaune Estuary/Slatty Water subsite during the day (personal data). As well as the Slatty Water and Lough Beg roosts, nocturnal Curlew roosts occur at Rossleague, Rathcoursey and Saleen Creek, and there may be additional roosts elsewhere. As a very rough estimate, I consider that the typical mid-winter Cork Harbour Curlew population may be in the range 1500-2500 birds. This would mean that the potential displacement due to the proposed M28

² Count data for the 2015/16 winter has not been collated yet.

upgrade scheme would represent around 0.5-0.8% of the Cork Harbour mid-winter Curlew population.

Table 17 Curlew count totals from Irish Wetland Bird Survey (I-WeBS) counts of Cork Harbour.

Season	Sep	Oct	Nov	Dec	Jan	Feb	Mar
2011/12	1662	978	887	623	1357	1197	324
2012/13	1234	1139	506	-	628	1266	-
2013/14	1163	-	747	846	883	855	527
2014/15	1987	1307	-	662	797	851	-

Source: *Cork Harbour I-WeBS counts: Summary report for the winter of 2014/15* (www.gittings.ie/downloads).

5.3. POTENTIAL IMPACTS

5.3.1. Habitat loss

The proposed route of the M28 upgrade scheme will cause direct removal of grassland habitat within CA6, which is used by feeding Curlews.

Loss of intertidal habitat is generally considered to be a potentially significant impact because intertidal habitat is a limited resource, so the displaced birds may not be able to find any alternative habitat that is not already at its effective carrying capacity. If this is the case, the displaced birds will have to compete with birds elsewhere in the site for food, and density-dependent reductions in survivorship and/or body condition may occur. Density-dependent reductions in survivorship mean that survival rates decrease as population density increases. Loss of body condition in overwintering bird populations may result in reduced survivorship on spring migration.

Loss of grassland habitats used by field feeding waders present a different scenario. There is, effectively, an unlimited supply of potentially suitable habitat, although there may be variations in habitat quality. Therefore, in general, it is very likely that birds displaced by loss of grassland habitat will be able to find suitable alternative habitat. The alternative habitat may not be of as high quality as the habitat that they were displaced from, but would still be likely to be capable of supporting the displaced birds. There may be exceptions to the above, where an area of fields has features that make it particularly suitable for field feeding birds (as may be the case with CA1). However, the low level of usage of CA6 by field feeding Curlew indicate that it has no such features. Therefore, I consider it reasonable to conclude that any Curlew displaced from field feeding habitat in CA6 by construction of the M28 upgrade scheme will be likely to find suitable alternative habitat.

5.3.2. Disturbance/habitat fragmentation

The proposed route of the M28 upgrade scheme will be adjacent to grassland habitat in CA5 and CA6 used by feeding Curlews. Concern has been raised by NPWS, that road schemes may cause a barrier that prevent Curlew from utilising habitats as they may be deterred from flying over the roads to reach the habitat. In my opinion, a more realistic, but related concern, is that disturbance from major roads cause avoidance, or reduced utilisation, of suitable habitats adjacent to the roads.

The fact that Curlew continue to use intertidal habitat in areas adjacent to major roads (e.g., the Douglas Estuary, Lough Mahon, Dunkettle, and the Glounthaune Estuary/Slatty Water) suggest that disturbance/fragmentation impacts from road development do not cause complete avoidance of affected areas.

The results of the analysis of my data on field feeding around the Glounthaune Estuary/Slatty Water shows that Curlew continue to utilise fields adjacent to the N25 dual carriageway, and there is no evidence of reduced utilisation of these fields compared to more distant fields. The dual carriageway bisects the estuary and Curlew routinely fly across the carriageway to move between feeding areas and roosts, etc. As discussed above, there are limitations to the conclusions that can be drawn from this analysis, but the results do indicate that any disturbance/fragmentation impacts from road development will be of limited magnitude.

There are many studies on disturbance impacts to waterbirds. However, the interpretation of these studies is complicated as disturbance responses are site specific due to habituation effects.

Therefore, for various reasons, many studies with information on disturbance responses of Curlew are not relevant to the present assessment. One study of some relevance was carried out by Burton et al. (2002). They carried out analyses of waterbird distribution (including Curlew) in six estuaries in southern England in relation to the proximity of footpaths and other man-made landscape features. Their study used data from Wetland Bird Survey (WeBS) low tide counts and related bird numbers in individual count sectors to the proportions of the count sectors within defined distances (25 intervals from 0-500 m) of roads and other features. They found that the proportion of the count sector within 25 m of a road caused a significant reduction in Curlew numbers. This study provides some strong evidence indicating that the presence of roads along the shoreline affects the within-site distribution of Curlew, and the geographical scale of the effect (limited to the immediate vicinity of the road) accords with what might be intuitively expected from general experience of Curlew behaviour. However, as the study does not indicate the effect sizes (the magnitude of the reduction in bird numbers caused by a specified level of road development), the ecological significance of this result is difficult to assess.

A study by Hayhow (2009) on Black-tailed Godwits is also of some relevance because this study was carried out across nine sites in southern Ireland, four of which were in Cork Harbour. This study examined the effects of urbanisation on godwit distribution and behaviour. It used an index of urbanisation that included the distance to the nearest road and the traffic levels. The study found that there was no relationship between levels of urbanisation and godwit foraging or vigilance behaviour, although there were higher vigilance levels and a greater frequency of disturbance flights on grasslands compared to mudflats.

5.4. CONCLUSION

Based on my own experience and knowledge of Curlew behaviour in Cork Harbour, the results of analysis of my data on field feeding around the Glounthaune Estuary/Slatty Water, and the available literature evidence, I consider that:

- Any Curlew displaced from field feeding areas by direct habitat loss due to the proposed road scheme are likely to be able to find suitable alternative habitat.
- There is no potential for any fragmentation impacts (i.e., the impact from the road causing a barrier that prevents Curlew from utilising habitats by deterring them flying over the road to reach the habitat).
- Any disturbance impacts (from the operational road) to adjacent habitats will be minor and will not cause large-scale exclusion of Curlew from adjoining habitats.

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Appendix 1 Scientific names of bird species mentioned in the text

Common name	Scientific name	Common name	Scientific name
Blackbird	<i>Turdus merula</i>	Lapwing	<i>Vanellus vanellus</i>
Black-headed Gull	<i>Chroicocephalus ridibundus</i>	Lesser Black-backed Gull	<i>Larus fuscus</i>
Black-tailed Godwit	<i>Limosa limosa</i>	Linnet	<i>Carduelis cannabina</i>
Blue Tit	<i>Cyanistes caeruleus</i>	Little Egret	<i>Egretta garzetta</i>
Bullfinch	<i>Pyrrhula pyrrhula</i>	Long-tailed Tit	<i>Aegithalos caudatus</i>
Buzzard	<i>Buteo buteo</i>	Magpie	<i>Pica pica</i>
Chaffinch	<i>Fringilla coelebs</i>	Mallard	<i>Anas platyrhynchos</i>
Chiffchaff	<i>Phylloscopus collybita</i>	Meadow Pipit	<i>Anthus pratensis</i>
Coal Tit	<i>Periparus ater</i>	Mediterranean Gull	<i>Larus melanocephalus</i>
Coal Tit	<i>Periparus ater</i>	Mistle Thrush	<i>Turdus viscivorus</i>
Common Gull	<i>Larus canus</i>	Oystercatcher	<i>Haematopus ostralegus</i>
Common Gull	<i>Larus canus</i>	Pheasant	<i>Phasianus colchicus</i>
Curlew	<i>Numenius arquata</i>	Pied Wagtail	<i>Motacilla alba yarelli</i>
Dunlin	<i>Calidris alpina</i>	Raven	<i>Corvus corax</i>
Dunlin	<i>Calidris alpina</i>	Redshank	<i>Tringa totanus</i>
Dunnock	<i>Prunella modularis</i>	Redwing	<i>Turdus iliacus</i>
Feral Pigeon	<i>Columba livia</i>	Robin	<i>Erithacus rubecula</i>
Goldcrest	<i>Regulus regulus</i>	Rook	<i>Corvus frugilegus</i>
Golden Plover	<i>Pluvialis apricaria</i>	Shelduck	<i>Tadorna tadorna</i>
Goldfinch	<i>Carduelis carduelis</i>	Siskin	<i>Carduelis spinus</i>
Great Tit	<i>Parus major</i>	Skylark	<i>Alauda arvensis</i>
Greenfinch	<i>Chloris chloris</i>	Snipe	<i>Gallinago gallinago</i>
Greenshank	<i>Tringa nebularia</i>	Song Thrush	<i>Turdus philomelos</i>
Grey Heron	<i>Ardea cinerea</i>	Sparrowhawk	<i>Accipiter nisus</i>
Grey Wagtail	<i>Motacilla cinerea</i>	Starling	<i>Sturnus vulgaris</i>
Grey Wagtail	<i>Motacilla cinerea</i>	Stock Dove	<i>Columba oenas</i>
Herring Gull	<i>Larus argentatus</i>	Teal	<i>Anas crecca</i>
Hooded Crow	<i>Corvus cornix</i>	Turnstone	<i>Arenaria interpres</i>
House Sparrow	<i>Passer domesticus</i>	Woodpigeon	<i>Columba palumbus</i>
Jack Snipe	<i>Lymnocyptes minimus</i>	Wren	<i>Troglodytes troglodytes</i>
Jackdaw	<i>Corvus monedula</i>	Yellowhammer	<i>Emberiza citrinella</i>

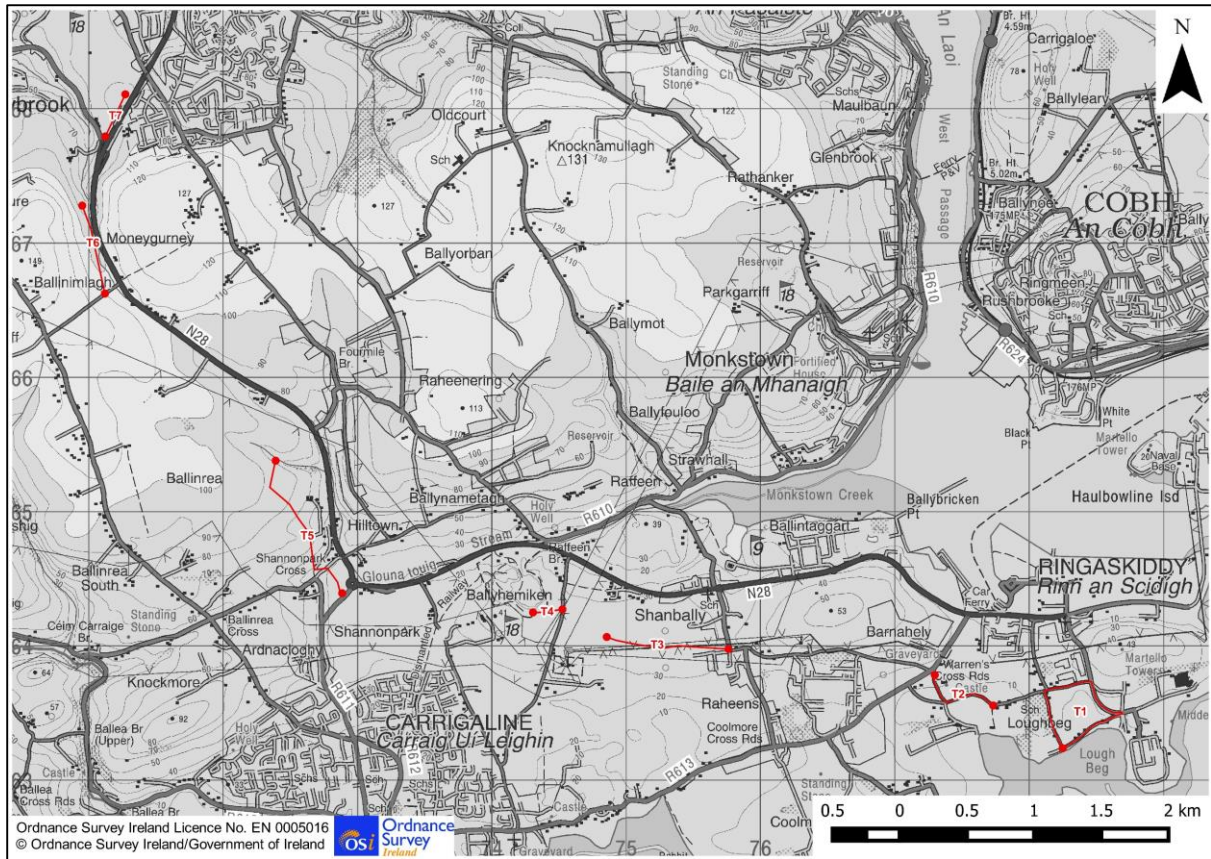


Figure 1. Transect routes.

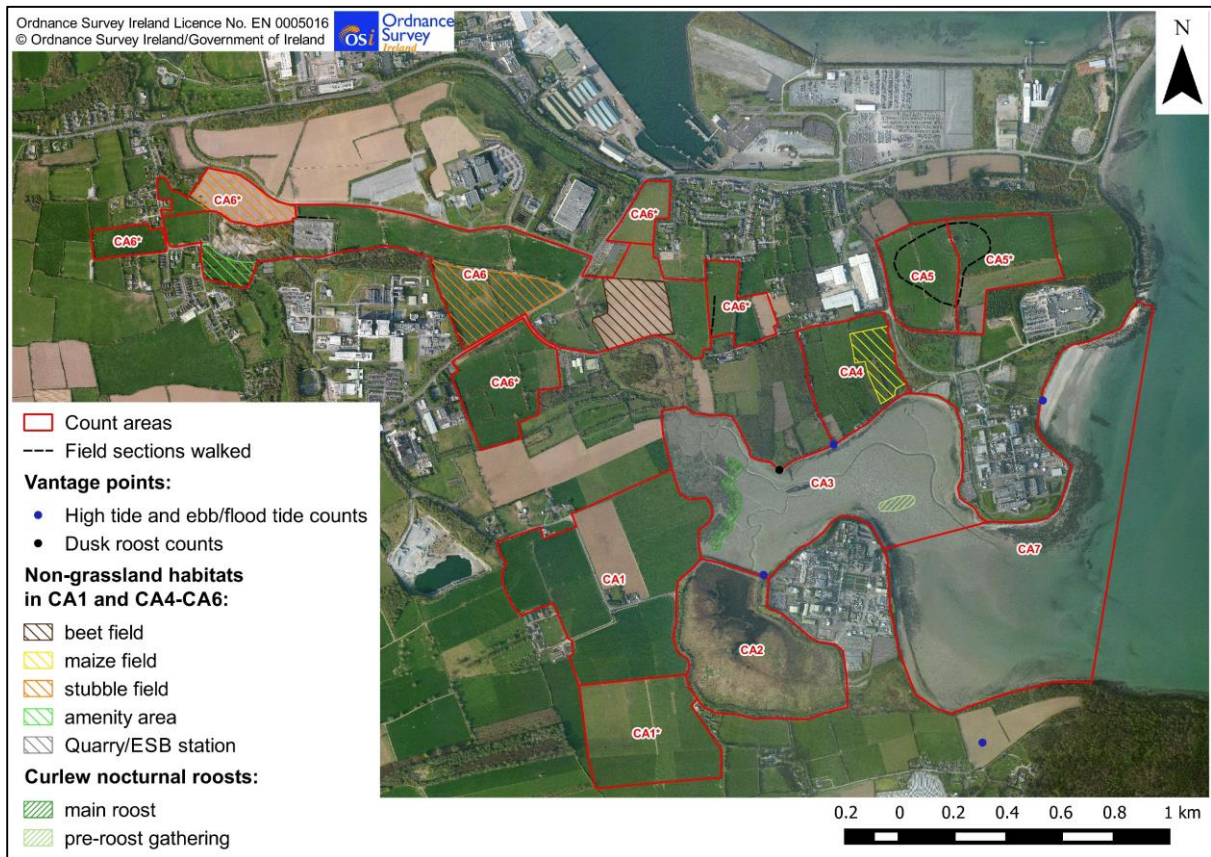


Figure 2. Count areas used for the field feeding wader survey.

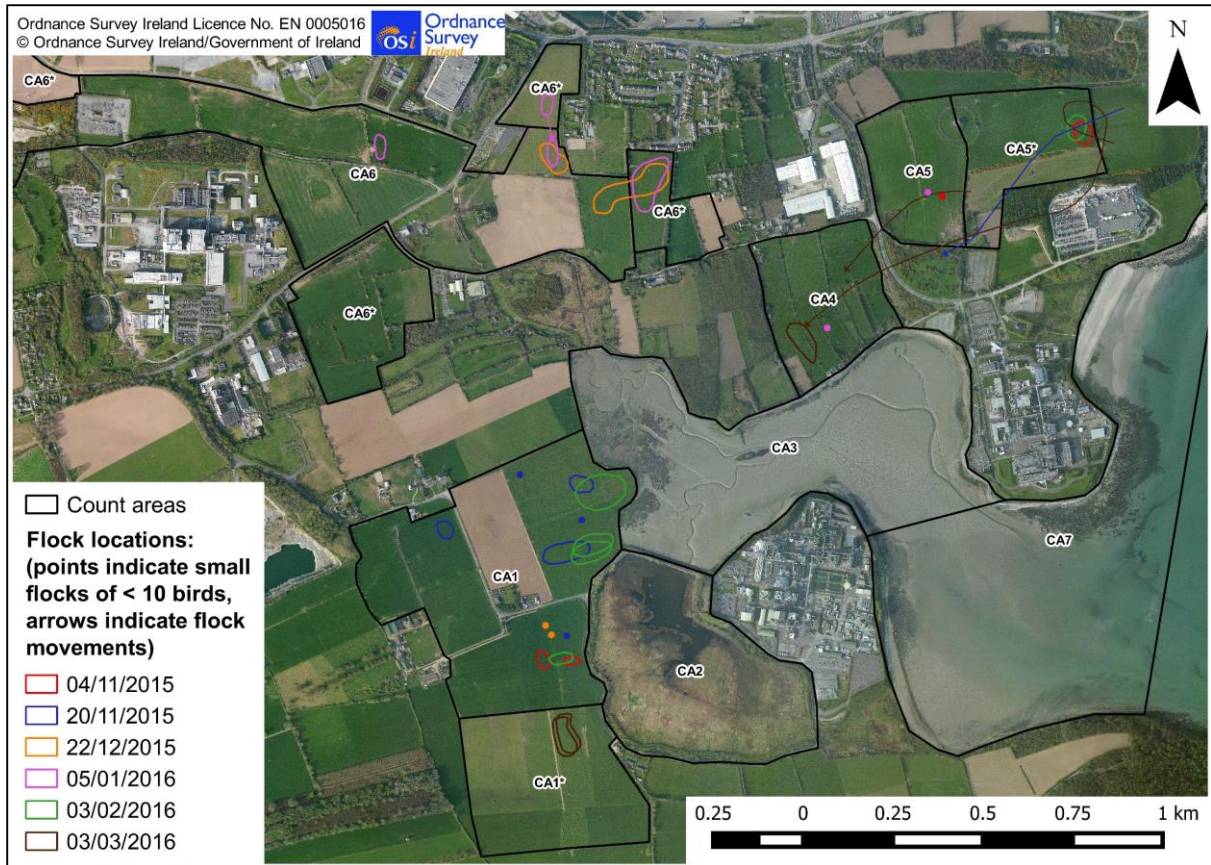


Figure 3. Location of Curlew flocks recorded in CA1 and CA4-6 during the field feeding surveys.

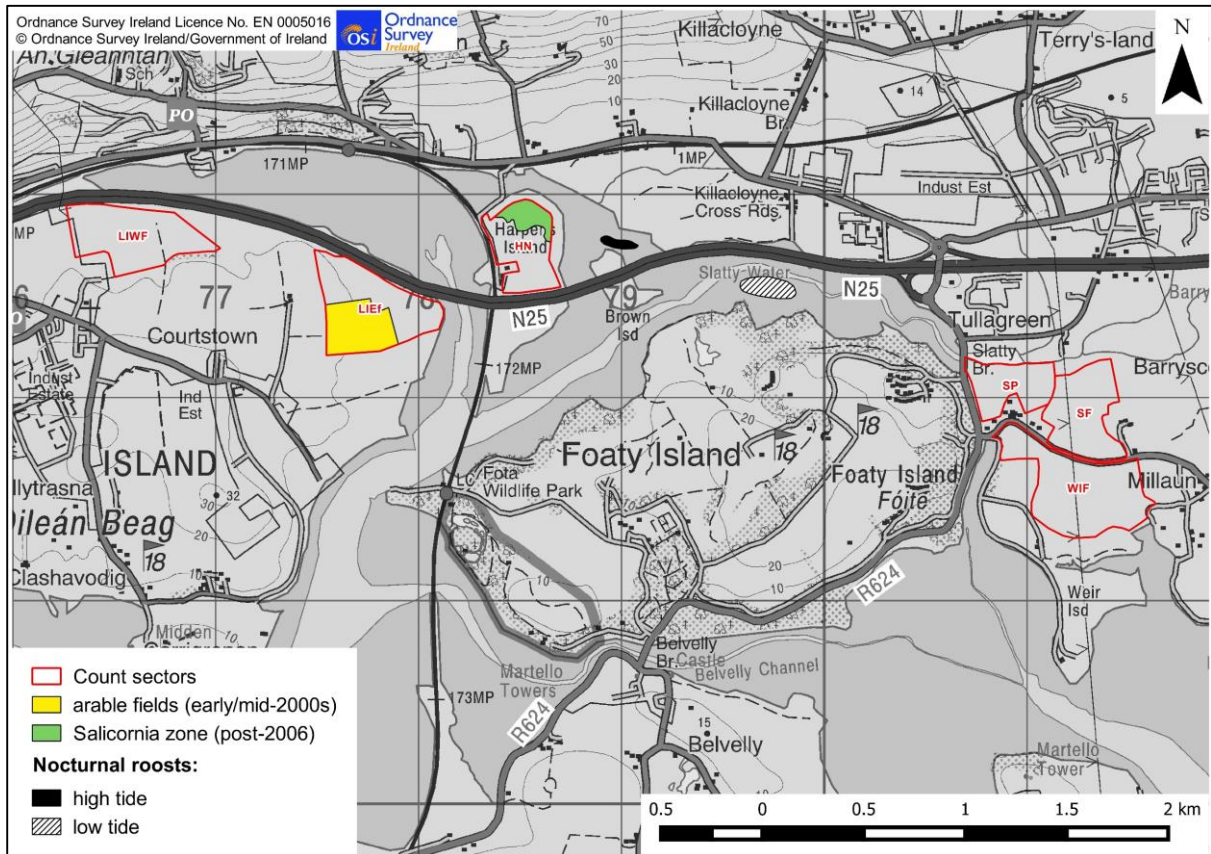
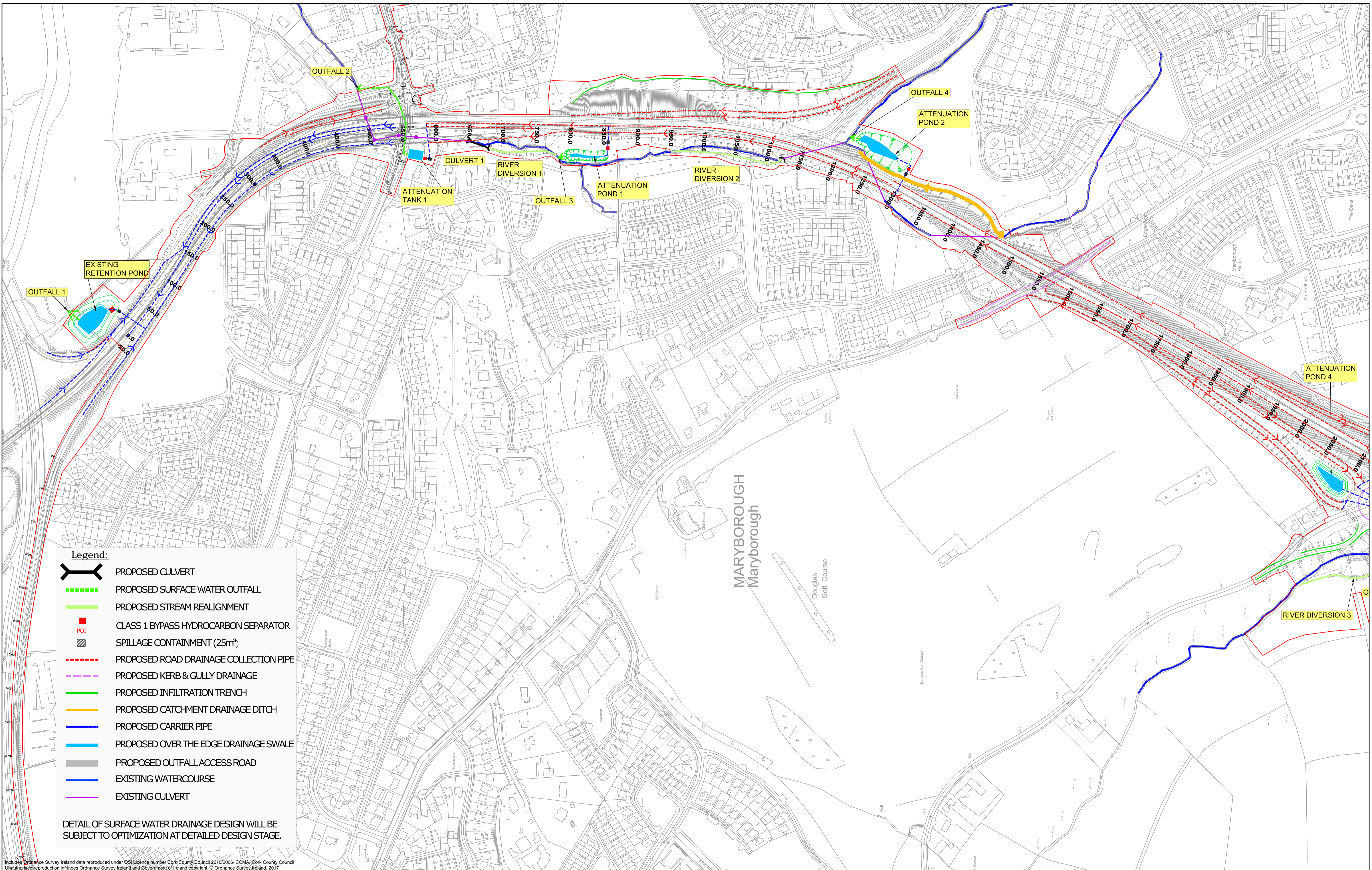


Figure 4. Glounthaune Estuary/Slattery Water count sectors included in the analyses of field feeding Curlew.

APPENDIX C

DRAINAGE DESIGN DRAWINGS



- Legend:**
- PROPOSED CULVERT
 - PROPOSED SURFACE WATER OUTFALL
 - PROPOSED STREAM REALIGNMENT
 - CLASS 1 BYPASS HYDROCARBON SEPARATOR
 - SPILLAGE CONTAINMENT (25m²)
 - PROPOSED ROAD DRAINAGE COLLECTION PIPE
 - PROPOSED KERB & GULLY DRAINAGE
 - PROPOSED INFILTRATION TRENCH
 - PROPOSED CATCHMENT DRAINAGE DITCH
 - PROPOSED CARRIER PIPE
 - PROPOSED OVER THE EDGE DRAINAGE SWALE
 - PROPOSED OUTFALL ACCESS ROAD
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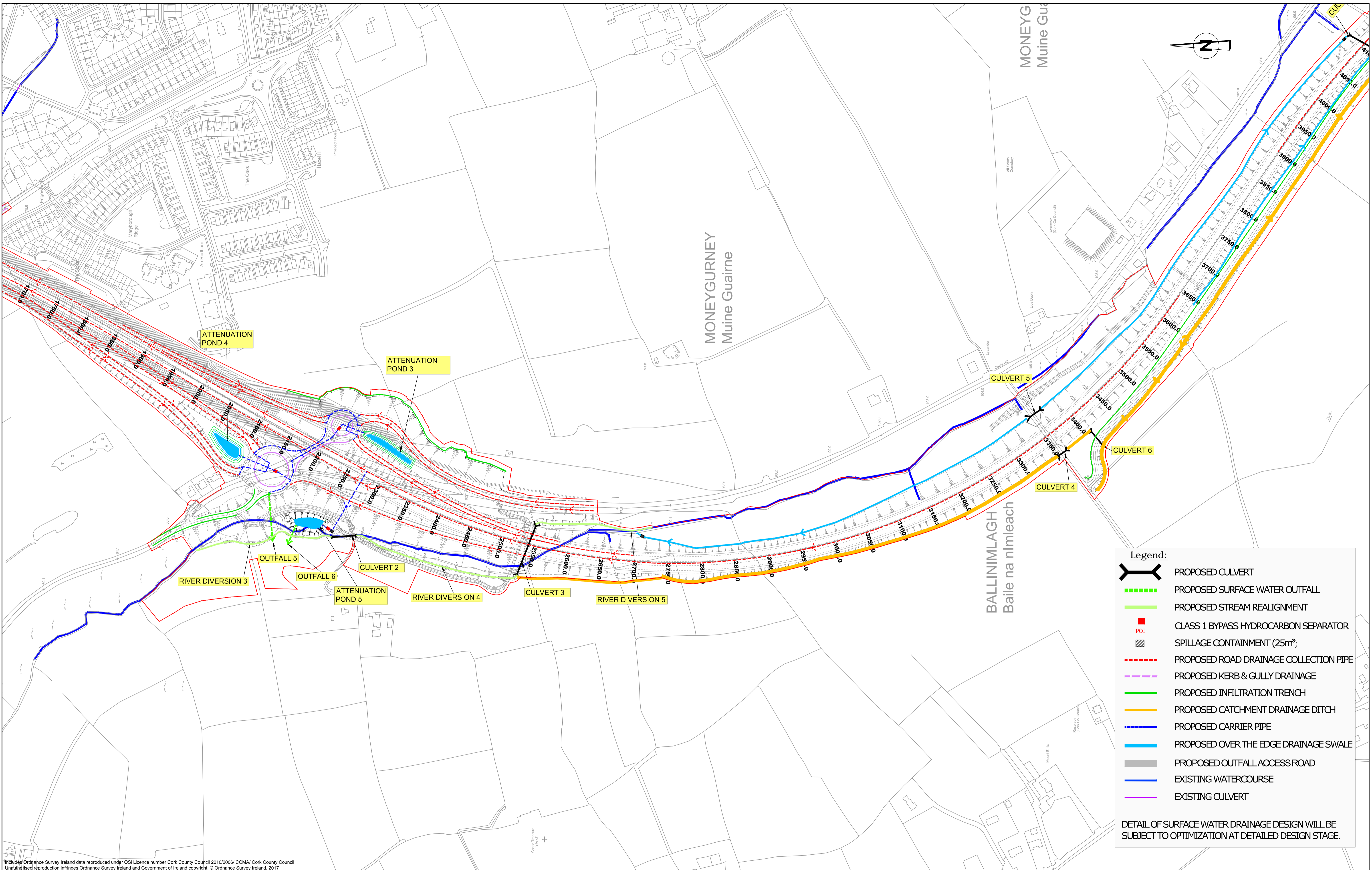
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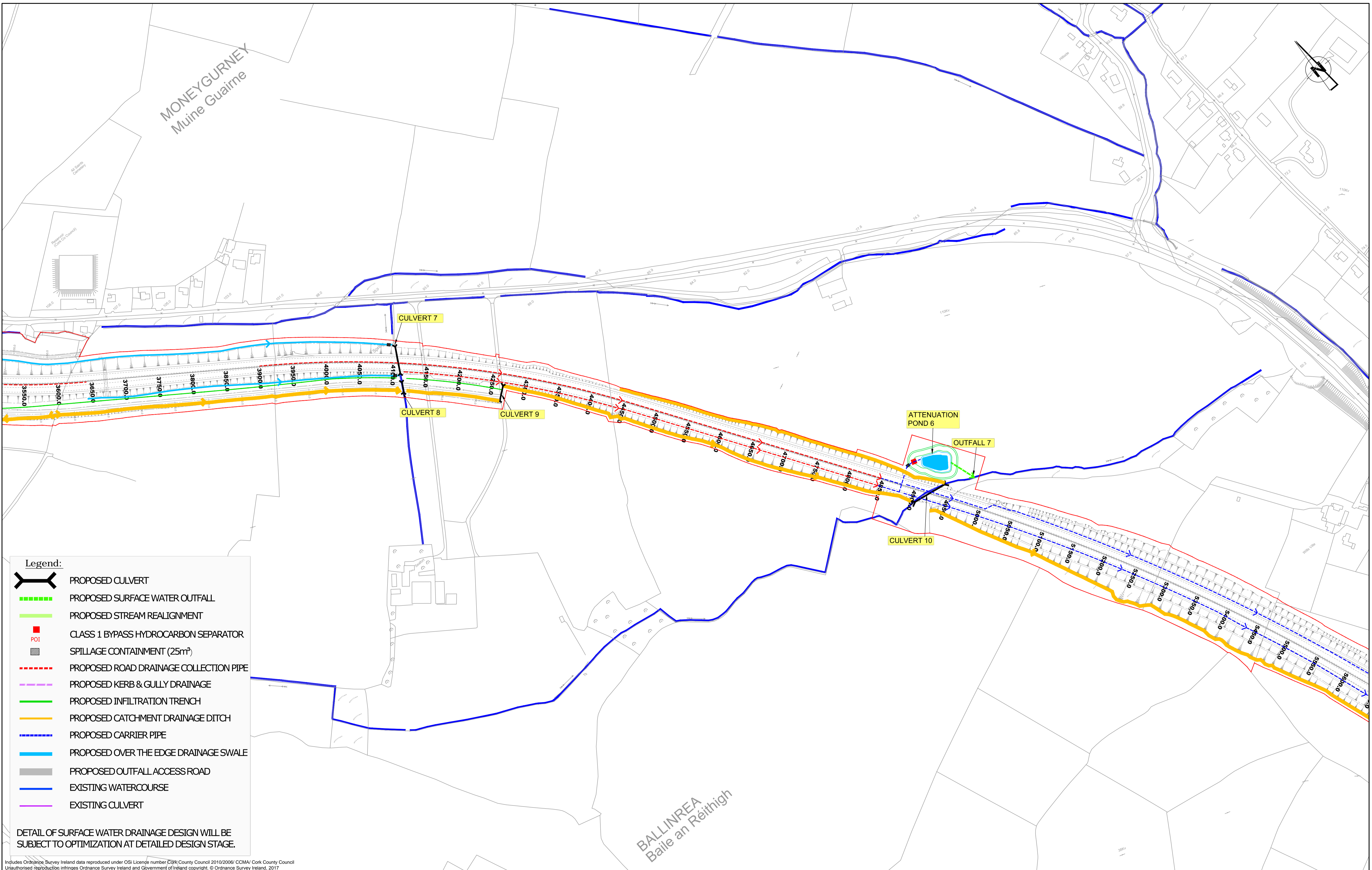
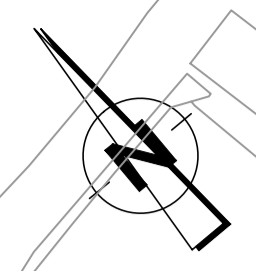


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 - CLASS 1 BYPASS HYDROCARBON SEPARATOR
 - POI
 - SPILLAGE CONTAINMENT (25m²)
 - PROPOSED ROAD DRAINAGE COLLECTION PIPE
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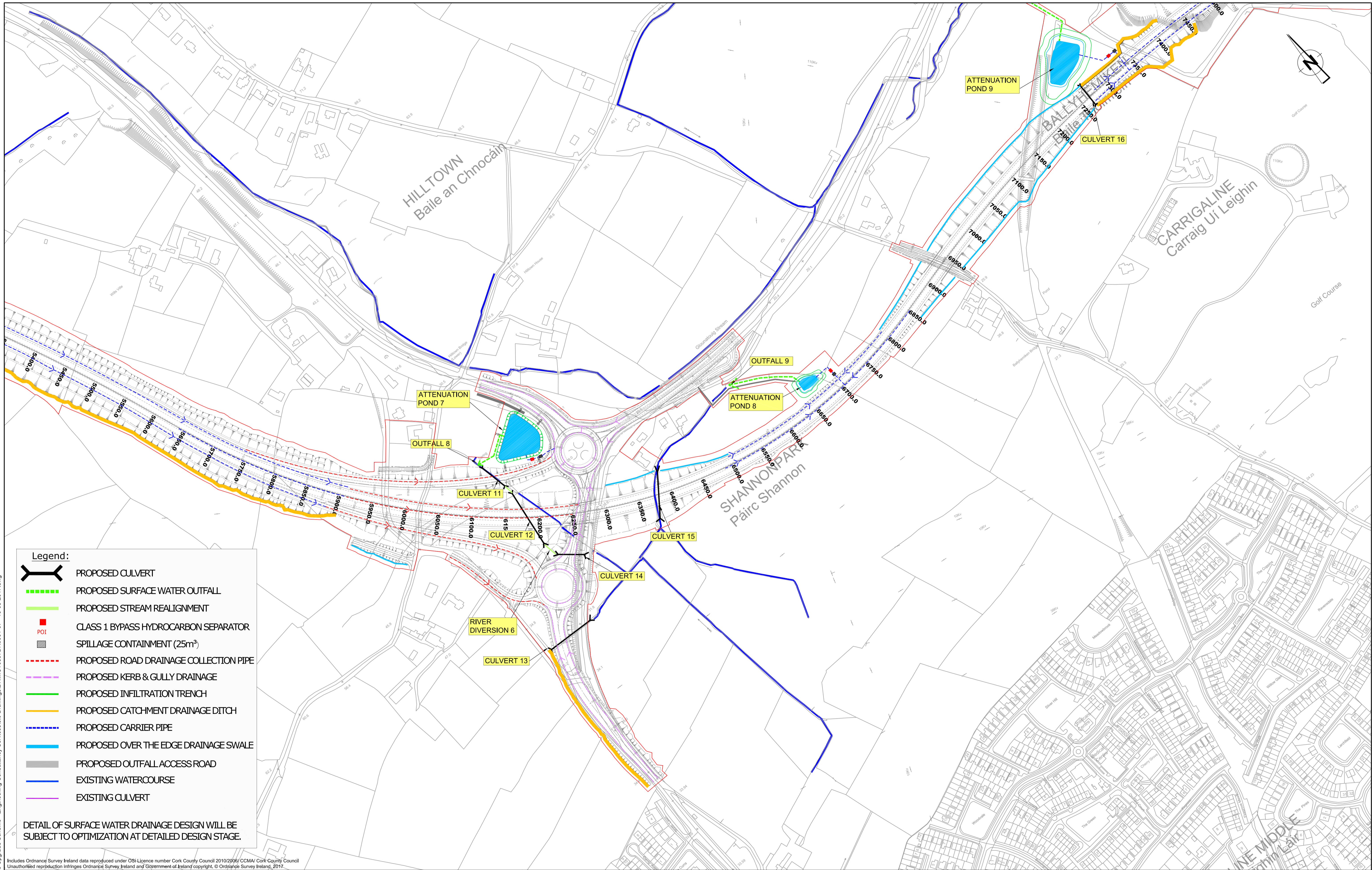
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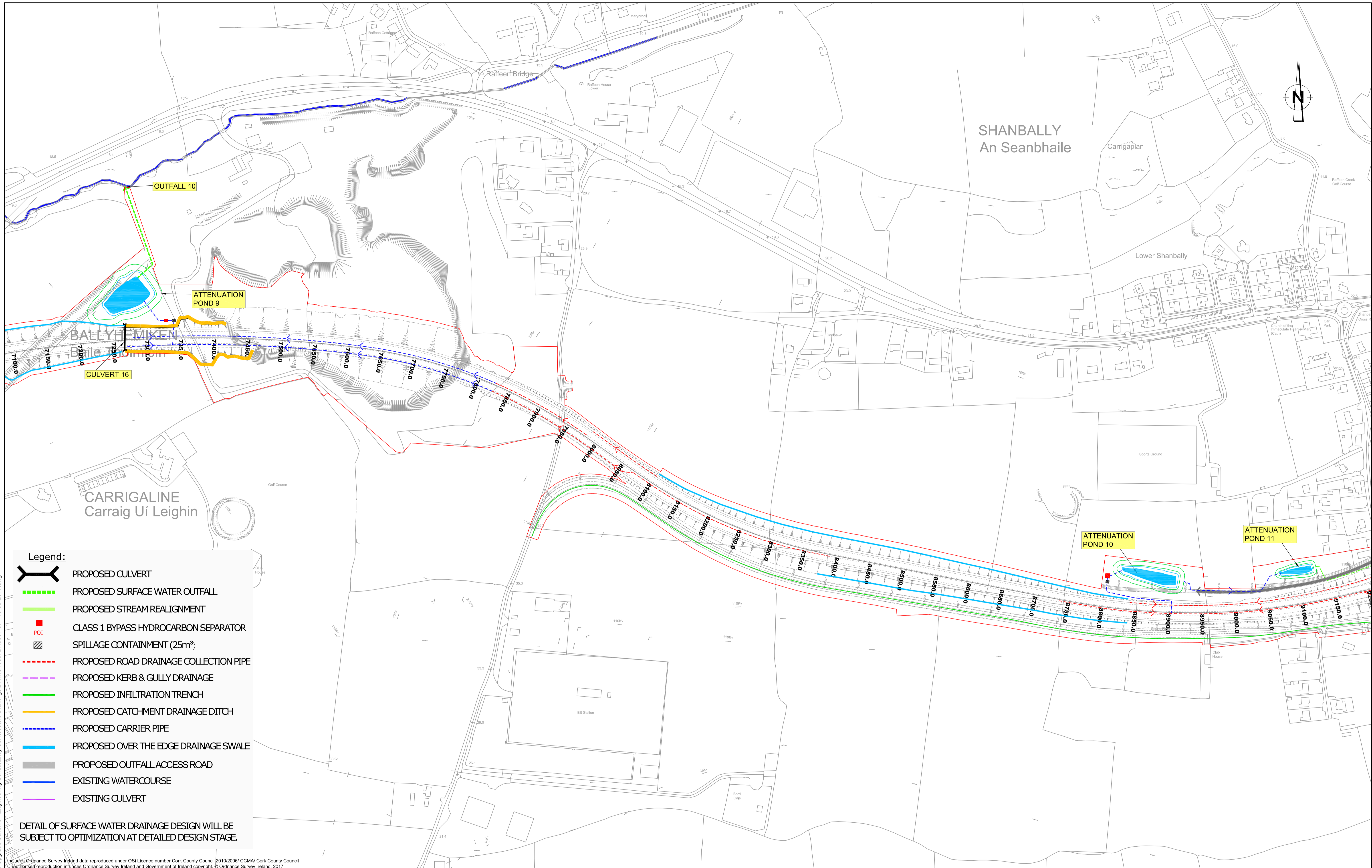
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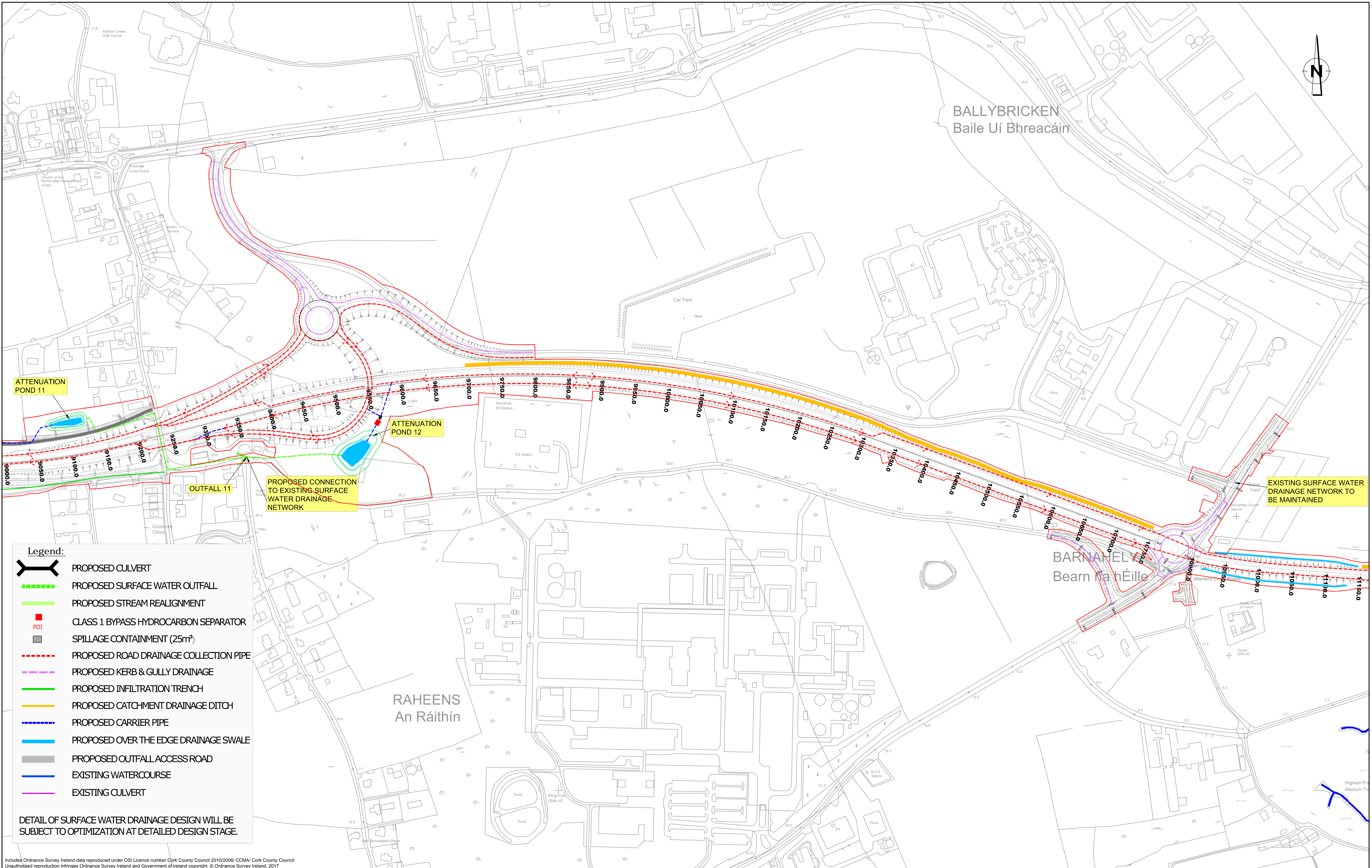
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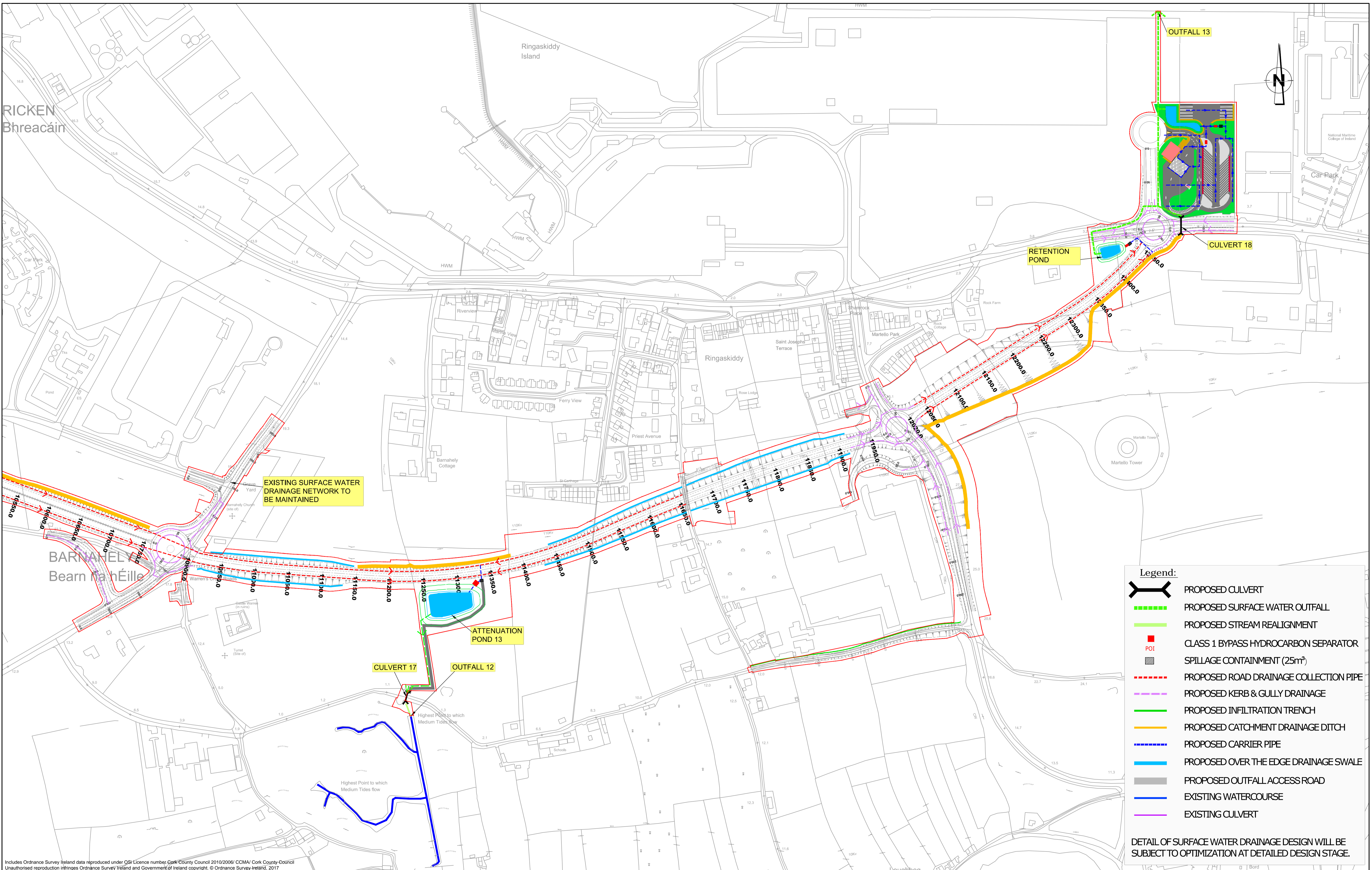
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Legend:

- PROPOSED CULVERT
- PROPOSED SURFACE WATER OUTFALL
- PROPOSED STREAM REALIGNMENT
- CLASS 1 BYPASS HYDROCARBON SEPARATOR SPILLAGE CONTAINMENT (25m²)
- POI
- PROPOSED ROAD DRAINAGE COLLECTION PIPE
- PROPOSED KERB & GULLY DRAINAGE
- PROPOSED INFILTRATION TRENCH
- PROPOSED CATCHMENT DRAINAGE DITCH
- PROPOSED CARRIER PIPE
- PROPOSED OVER THE EDGE DRAINAGE SWALE
- PROPOSED OUTFALL ACCESS ROAD
- EXISTING WATERCOURSE
- EXISTING CULVERT

DETAIL OF SURFACE WATER DRAINAGE DESIGN WILL BE SUBJECT TO OPTIMIZATION AT DETAILED DESIGN STAGE.

Client

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No.	Date	Amendment / Issue	App
F01	May17	FINAL ISSUE	

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Drawn	KT	Project	M28 CORK TO RINGASKIDDY
Checked	AP	Title	DRAINAGE - PROPOSED DRAINAGE DESIGN
Approved	LB	Sheet	Sheet 7 of 7
Date	Apr. 2015	File Ref.	MCT0597DR0001-07.dwg
Scale	1:5000 @ A3 1:2500 @ A1	Drg. No.	DR0007
Job No.	MCT0597	Rev.	F01