



Chapter 12
Biodiversity

Contents

12. Biodiversity	1
12.1 Introduction	1
12.2 Methodology	1
12.2.1 Ecological Survey Study Area	2
12.2.2 Relevant Guidelines, Policy and Legislation	2
12.2.3 Data Collection and Collation	4
12.2.4 Appraisal Method for the Assessment of Impacts	9
12.3 Baseline Environment.....	11
12.3.1 Zone of Influence (Zol)	12
12.3.2 Desk Study	14
12.3.3 Biodiversity Areas	14
12.3.4 Designated Areas for Nature Conservation	15
12.3.5 Habitats	25
12.3.6 Rare and Protected Plant Species	34
12.3.7 Non-Native Invasive Plant Species	35
12.3.8 Mammals	35
12.3.9 Birds.....	40
12.3.10 Reptiles.....	45
12.3.11 Amphibians	45
12.3.12 Fish	46
12.3.13 Invertebrates.....	47
12.3.14 Summary of Ecological Valuation and Identification of KERs	49
12.4 Potential Impacts	52
12.4.1 Characteristics of the Proposed Scheme	52
12.4.2 'Do Nothing' Scenario.....	54
12.4.3 Construction Phase	54
12.4.4 Operational Phase	82
12.5 Mitigation and Monitoring Measures	94
12.5.1 Construction Phase	94
12.5.2 Operational Phase	107
12.6 Residual Impacts	112
12.6.1 Construction Phase	112
12.6.2 Operational Phase	115
12.7 References	119

12. Biodiversity

12.1 Introduction

This Chapter of the Environmental Impact Assessment Report (EIAR) presents the output of the biodiversity assessment and contains information regarding, *inter alia*, the biodiversity baseline scenario, the potential impacts on biodiversity, the mitigation measures and the predicted residual effects associated with the Ballymun / Finglas to City Centre Core Bus Corridor Scheme (hereafter referred to as the Proposed Scheme).

The likely significant effects of the Proposed Scheme on biodiversity during both the Construction and Operational Phases (including routine maintenance) have been assessed. The potential Construction Phase impacts assessed include those on air, water quality, habitats, and on flora and fauna from construction activities such as utility diversions, road resurfacing, and road realignments. The assessment undertaken for the Proposed Scheme identified numerous Key Ecological Receptors (KERs) within the study area that could potentially be impacted by the Proposed Scheme. These KERs are examined in detail in this Chapter. The methodologies used to collate information on the baseline biodiversity environment and assess the likely significant impacts of the Proposed Scheme are detailed in the following sections.

The aim of the Proposed Scheme, when in operation, is to provide enhanced walking, cycling and bus infrastructure on this key access corridor in the Dublin region, which will enable and deliver efficient, safe, and integrated sustainable transport movement along the corridor. The objectives of the Proposed Scheme are described in Chapter 1 (Introduction). The Proposed Scheme, which is described in Chapter 4 (Proposed Scheme Description) has been designed to meet these objectives.

The design of the Proposed Scheme has evolved through comprehensive design iteration, with particular emphasis on minimising the potential for environmental impacts, where practicable, whilst ensuring the objectives of the Proposed Scheme are attained. In addition, feedback received from the comprehensive consultation programme undertaken throughout the option selection and design development process has been incorporated, where appropriate.

12.2 Methodology

In accordance with the requirements of Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment (hereafter referred to as the EIA Directive), this Chapter of the EIAR identifies, describes and assesses the likely direct and indirect significant impacts of the Proposed Scheme on biodiversity, with particular attention to species and habitats protected under both European Union (EU) and Irish law.

The EIA Directive does not provide a definition of biodiversity. However, as noted in the European Commission Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Commission 2013), Article 2 of the Convention on Biological Diversity (CBD), gives the following formal definition of biodiversity:

'biological diversity means the variability among living organisms from all sources including, inter alia, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part; this includes diversity within species, between species and of ecosystems' (CBD 2006).

Alongside the term '*biodiversity*', the terms '*ecology*' and '*ecological*' are also used throughout this Chapter as broader terms to consider the relationships of biodiversity receptors to one another and with the wider environment.

This Chapter also refers to the Appropriate Assessment Screening Report (hereafter referred to as the AA Screening Report) and the Natura Impact Statement (hereafter referred to as the NIS) which have also been prepared on behalf of the National Transport Authority (NTA) and submitted with the application for approval, so as to enable An Bord Pleanála (the Board), as competent authority, to carry out the assessments required pursuant to Article 6(3) of Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (hereafter referred to as the Habitats Directive).

A review of the Proposed Scheme was undertaken which identified numerous KERs within the study area that could potentially be impacted by the Proposed Scheme. These KERs are examined in detail in this Chapter.

The methodologies used to collate information on the baseline biodiversity environment and assess the likely significant effects of the Proposed Scheme are detailed in the following sections.

12.2.1 Ecological Survey Study Area

Ecological surveys were carried out for each of the biodiversity receptors listed in Table 12.1, within a specific study area (as illustrated in Figure 12.1.1 to Figure 12.1.3 in Volume 3 of this EIAR) and focused on assessing potential impacts within the Zone of Influence (Zol) of the Proposed Scheme. The Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK and Ireland (hereafter referred to as the CIEEM Guidelines) (CIEEM 2018) define the Zol for a development as the area over which ecological features may be subject to significant impacts as a result of a development and associated activities (see Section 12.3.1 for more detail on the Zol as it relates to the Proposed Scheme and the various ecological receptors).

The ecological surveys were designed based upon the characteristics of the Proposed Scheme and its likely significant impacts on the baseline environment during construction and / or operation. The study areas are described in Table 12.1 and, where relevant, are also shown on the Figure 12.1.1 to Figure 12.1.3 in Volume 3 of this EIAR.

Table 12.1: Ecological Survey Study Areas for Each Ecological Receptor

Ecological Receptor	Study Area Description
Habitats	The area within or immediately adjacent to the Proposed Scheme footprint where habitats could be directly or indirectly affected during construction / operation. The extent of the study area for habitats is illustrated in Figure 12.5 in Volume 3 of this EIAR.
Rare and / or Protected Flora	The area within or immediately adjacent to the Proposed Scheme footprint where rare and / or protected flora could be directly or indirectly affected during construction / operation. The extent of the study area for rare and / or protected flora is illustrated in Figure 12.5 in Volume 3 of this EIAR.
Fauna species other than those listed below (includes badger, otter, other protected mammal species, amphibians, and reptiles)	The area within or immediately adjacent to the Proposed Scheme footprint where fauna species could be directly or indirectly affected during construction / operation. The extent of the study area for fauna species (other than bats and breeding birds) is illustrated in the Figure 12.9 in Volume 3 of this EIAR.
Bats	The area suitable for roosting, foraging and / or commuting bats (e.g. bridges, hedgerows, treelines, woodland and watercourses) within or immediately adjacent to the Proposed Scheme footprint where bats could be directly or indirectly affected during construction / operation. The extent of the study area for bats is illustrated in Figure 12.1.1 in Volume 3 of this EIAR.
Wintering Birds	The area suitable for wintering birds within or immediately adjacent to the Proposed Scheme footprint where wintering birds could be directly affected during construction / operation. The extent of the study area for wintering birds is illustrated in Figure 12.1.2 in Volume 3 of this EIAR.
Nesting Kingfisher suitability	Watercourses crossed by the Proposed Scheme footprint nesting birds (i.e. kingfisher) could be directly affected during construction / operation. The extent of the study area for kingfisher suitability is illustrated in Figure 12.1.3 in Volume 3 of this EIAR.
Aquatic Ecology	Watercourses crossed by the Proposed Scheme footprint where the aquatic ecology could be directly or indirectly affected during construction / operation. The extent of the study area for aquatic ecology is illustrated in Figure 12.1.3 in Volume 3 of this EIAR.

12.2.2 Relevant Guidelines, Policy and Legislation

The assessment supporting this Chapter has been undertaken in accordance with the following guidance documents:

- Environmental Impact Assessment of Projects - Guidance on the Preparation of the Environmental Impact Assessment Report (European Commission 2017);
- Environmental Protection Agency (EPA) Guidelines on the Information to be Contained in Environmental Impact Assessment Reports (hereafter referred to as the EPA Guidelines) (EPA 2022);
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Commission 2013);

- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (hereafter referred to as the CIEEM Guidelines) (CIEEM 2018);
- National Roads Authority (NRA) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (NRA 2005a);¹
- Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes (NRA 2005b);
- Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes (NRA 2006a);
- Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (NRA 2006b);
- Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes (NRA 2008a);
- Environmental Impact Assessment of National Road Schemes – A Practical Guide (NRA 2008b);
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2009);
- The Management of Invasive Alien Plant Species on National Roads - Technical Guidance (TII 2020a);
- The Management of Invasive Alien Plant Species on National Roads – Standard (TII 2020b);
- Bat Surveys for Professional Ecologists: Good Practice Guidelines 3rd edition (Collins J (ed.) 2016);
- The Bat Workers' Manual (Mitchell-Jones and McLeish 1999);
- Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals No. 25 (Kelleher and Marnell 2006);
- The Irish Bat Monitoring Programme 2015 - 2017. Irish Wildlife Manuals 103. (Aughney *et al.* 2018);
- United Kingdom Highways Agency (UKHA) Design Manual for Roads and Bridges (DMRB) (UKHA 2001a; UKHA 2001b; UKHA 2005);
- Circular Letter NPWS 2/07 Guidance on compliance with Regulation 23 of the Habitats Regulations 1997 – strict protection of certain species / applications for derogation licences (National Parks and Wildlife Service (NPWS 2007a)); and
- National Biodiversity Data Centre (NBDC) All-Ireland Pollinator Plan 2021-2025, National Biodiversity Data Centre Series No. 25, Waterford. March 2021 (NBDC 2021).

Policy and Planning Documents:

- Department of Culture, Heritage, and the Gaeltacht (DCHG) National Biodiversity Plan 2017 - 2021 (DCHG 2017);
- Dublin City Council (DCC) Dublin City Biodiversity Action Plan 2015 - 2020 (DCC 2015);
- Dublin City Development Plan 2016 - 2022 (DCC 2016);
- Fingal County Council (FCC 2010) Fingal Biodiversity Action Plan 2010 - 2015 (FCC 2010); and
- Fingal Development Plan 2017 - 2023 (FCC 2017).

Legislation:

- The Habitats Directive;
- The Birds Directive;
- Directive 2000/60/EC of the European Parliament and of the Council establishing a framework for the Community action in the field of water policy (hereafter referred to as the Water Framework Directive (WFD));
- S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011, as amended (hereafter referred to as the Birds and Habitats Regulations);
- The EIA Directive;
- Planning and Development Acts 2000 to 2021;
- Wildlife Acts 1976 to 2021;

¹ National Roads Authority (NRA) originally published the guidance documents. It was merged in 2015 with Railway Procurement Agency in 2015 to form the Transport Infrastructure Ireland (TII). Many of its earlier guidance documents are still referenced as NRA X where X is the year).

- S.I. No. 356 2015 - Flora (Protection) Order, 2015 (hereafter referred to as the Flora Protection Order); and
- Fisheries Acts 1959 to 2017.

12.2.3 Data Collection and Collation

12.2.3.1 Desk Study

A desk study involved collection and review of relevant published and unpublished sources of data, collation of existing information on the ecological environment and consultation with relevant statutory bodies.

The following sources were consulted during the desk study to inform the scope of the ecological surveys:

- Online data available on European sites and on Natural Heritage Areas (NHAs) or proposed Natural Heritage Areas (pNHAs) as held by the NPWS (NPWS 2021a);
- Online data records available on National Biodiversity Data Centre Database (NBDC 2022);
- Ordnance Survey Ireland (OSI) orthophotography (from 1995 to 2012) for the Proposed Scheme study area;
- Bus Connects Drone Imagery, surveyed November 2020 (NTA 2020);
- Records of rare and / or protected species for the 10km (kilometre) grid squares O03, O13 and O23, held by the NPWS;
- Protected species and habitats datasets returned after data request (NPWS 2021b);
- Habitat and species Geographic Information System (GIS) datasets provided by the NPWS (NPWS 2012a), including Article 12 and Article 17 data²;
- Bat records from Bat Conservation Ireland's (BCI) database (BCI 2020/1);
- Records from the Botanical Society of Britain and Ireland (BSBI);
- Information contained within the Flora of County Dublin (Doogue *et al.* 1998);
- Environmental information / data for the area available from the EPA website (EPA 2020);
- Information on the status of EU protected habitats and species in Ireland (NPWS 2019a, NPWS 2019b; NPWS 2019c); and
- Information on light-bellied Brent goose inland feeding sites (Scott Cawley Ltd. 2017).

A desk study was carried out to identify suitable bat foraging and / or commuting habitat (e.g., woodland, and mature treelines) that may be affected by the Proposed Scheme (e.g., areas where vegetation will, or is likely to be directly affected by works associated with the Proposed Scheme). Following this, transect routes for bat activity surveys were designed within these areas to encompass a representative sample of the habitats present within the Proposed Scheme area.

A desk study was carried out to identify any potential suitable inland feeding and / or roosting sites for winter birds located within or directly adjacent to the Proposed Scheme. This included a review of recent aerial photography and known inland feeding sites for the Special Conservation Interest (SCI) bird species light-bellied Brent goose *Branta bernicla hrota* (Scott Cawley Ltd. 2017). The desk study identified sites in which significant suitable foraging and / or roosting habitat would be directly lost as a consequence of the Proposed Scheme, for further wintering bird surveys.

A desk study was carried out to identify all hydrological crossing points within the footprint of the Proposed Scheme. Aquatic surveys, suitability assessments for nesting birds, and otter surveys were undertaken at the proposed crossing points at which instream works, modifications to banks or significant disturbance (i.e. piling / rock breaking techniques) are proposed.

² Article 17 of the EU Directive on the Conservation of Habitats, Floras and Fauna (Habitats Directive) required that all member states report to the European Commission every six years on the status and on the implementation of the measures taken under the Habitats Directive. In similar manner, there is an obligation to report on the status and trends of bird species required under Article 12 of the Bird's Directive.

12.2.3.2 Ecological Surveys

This Section describes the various ecological survey methodologies used to collate baseline ecological information in the preparation of this Chapter. The ecological surveys carried out are summarised in Table 12.2.

Table 12.2: Ecological Surveys and Survey Dates Between 2018 and 2022

Survey	Survey Date(s)	Surveyor Reference
Habitat survey	June to August 2018 August 2020 October 2020 May 2022	Scott Cawley Ltd.
Mammal surveys (excluding bats)	June to August 2018 August 2020 October 2020 May 2022	Scott Cawley Ltd.
Bat surveys:	<u>Walked transect activity surveys</u> June to August 2018 September and October 2019 May 2020 July 2020 July 2021 <u>Identification of potential roost features (PRFs)</u> June to August 2018 August 2020 March 2022	Scott Cawley Ltd.
Wintering birds	November 2020 to February 2021 October 2021 and March 2022	Scott Cawley Ltd.
Nesting kingfisher suitability assessment	October 2020	Scott Cawley Ltd.
Amphibian habitat suitability assessment	June to August 2018 August 2020	Scott Cawley Ltd.
Reptile habitat suitability assessment	June to August 2018 August 2020	Scott Cawley Ltd.
Fisheries / aquatic surveys	October and November 2020	Triturus Environmental Services Ltd.

12.2.3.3 Habitat Survey

Habitat surveys were carried out by Scott Cawley Ltd., between June and August 2018, August 2020, October 2020 and in May 2022. Aquatic habitat surveys were conducted by Triturus Environmental Ltd., between October and November 2020. All habitats located within or immediately adjacent to the Proposed Scheme footprint were surveyed and mapped to level three of the Heritage Council's A Guide to Habitats in Ireland habitat codes, after Fossitt (Fossitt 2000) and in accordance with Best Practice Guidance for Habitat Survey and Mapping (Smith *et al.* 2011). The level of field data quality (as per Smith *et al.* 2011) was also recorded. Plant species present that were either representative of a habitat or considered to be of conservation interest (i.e. those listed on the Flora Protection Order or listed in the 'threatened' category or higher on the Ireland Red List No. 10 Vascular Plants (Wyse Jackson *et al.* 2016) and the Ireland Red List No. 8 Bryophytes (Lockhart, Hodgetts and Holyoak 2012)) were recorded, along with their relative abundances. Non-native invasive plant species listed on the Third Schedule of the Birds and Habitats Regulations were also recorded. The habitat's extent was mapped onto an aerial photograph, with Global Positioning System (GPS) points taken where a habitat's extent could not be clearly identified from the aerial photograph. Vascular plant nomenclature follows that of the New Flora of the British Isles Fourth Edition (Stace 2019).

The Proposed Scheme will involve works at the Royal Canal. Therefore, the canal was surveyed by Triturus Environmental Ltd. in October and November 2020 (survey site CBC0304AQ001). A broad habitat assessment was conducted at each site utilising elements of the methodology provided for in the Environment Agency's River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003 (Environment Agency 2003) and the Irish Heritage Council's A Guide to Habitats in Ireland (Fossitt 2000). The site was assessed in terms of:

- Channel width and depth and other physical characteristics;
- Substrate type, listing substrate fractions in order of dominance (i.e. bedrock, boulder, cobble, gravel, sand, silt etc.);
- Flow type, listing percentage of riffle, glide and pool in the survey area;
- Instream macrophyte and aquatic bryophytes occurring and the prominence of each (DAFOR scale); and
- General riparian vegetation composition.

12.2.3.4 Mammals (Excluding Bats)

The footprint of the Proposed Scheme was surveyed for badger *Meles meles* and otter *Lutra lutra* activity as part of the multidisciplinary walkover surveys, undertaken between June and August 2018, and in August 2020. Surveys for otter were also undertaken on 31 May 2022. The presence / absence of these species was surveyed through the detection of field signs such as tracks, markings, feeding signs and droppings, as well as by direct observation. In addition, the study area was surveyed for the presence of badger setts and otter holts. Where present, any evidence of use was recorded.

The desk study identified one site where water bodies may be subject to significant disturbance (i.e. piling and instream works) as a consequence of the Proposed Scheme. The site is located at the proposed Royal Canal pedestrian / cycle bridge. A corridor of approximately 150m upstream and downstream of the crossing point was surveyed to identify the presence of otter holts. Areas surveyed are shown on Figure 12.1.3 in Volume 3 of this EIAR. The Proposed Scheme will only involve instream modifications to one bank, while the northern abutment will be set back a short distance from the canal bank.

No species-specific surveys were considered necessary for other protected mammal species for which field signs are less frequent and / or less reliable than other larger mammals, such as pine marten *Martes martes*, Irish stoat *Mustela erminea hibernica* and Irish hare *Lepus timidus*. Nevertheless, during all surveys, attention was paid to activity signs such as searching soft muds for tracks, and to look for droppings. Potential presence of these species in suitable habitat was determined based on the habitat preferences described in Exploring Irish Mammals (Hayden and Harrington 2000).

12.2.3.5 Bats

The following sections describe the methodologies employed to carry out the various bat surveys undertaken in 2019 and 2020 to inform the EIAR. The bat surveys were carried out under the following licences, issued by the NPWS:

- DER / BAT 2019-02 (amended) – Derogation licence to disturb bat roosts throughout the State;
- DER / BAT 2020-67 – Derogation licence to disturb bat roosts throughout the State; and
- DER / BAT 2021-01 – Derogation licence to disturb bat roosts throughout the State.

12.2.3.5.1 Bats – Walked Transect Surveys

Walked bat activity transect surveys were conducted along preselected transect routes at four locations along the Proposed Scheme. Transect routes were located at Mellows Park (referred to as CBC0304BT001), along R108 Ballymun Road at Albert College Park (referred to as CBC0304BT002), over the River Tolka at Dean Swift Bridge along R108 St. Mobhi Road in Glasnevin (referred to as CBC0304BT003), and over the Royal Canal at Cross Guns Bridge in Phibsborough (referred to as CBC0304BT004). The walked transect routes are shown on Figure 12.1.1 in Volume 3 of this EIAR.

Walked transect surveys comprised of visits to each transect route across three seasons; autumn, spring and summer, as guided by Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins 2016) (see Table 12.2 for specific dates). Surveys were conducted in June to August 2018, September and October 2019, May 2020, and July 2020 and in July 2021 at CBC0304BT004. Surveys commenced approximately 30 minutes after sunset to ensure that bats had emerged from their roosts. Surveys involved the surveyor walking each transect route at a slow pace using a handheld ultrasound bat detector (Elekon Batlogger M) to record any bat species present. Transect routes CBC0304BT002, CBC0304BT003, and CBC0304BT004 were surveyed across

all seasons and CBC0304BT001 was surveyed in spring and summer 2020 to capture changes to the Proposed Scheme. This limitation is incorporated into the assessment and a precautionary principle is applied.

All bat calls were analysed using Elekon BatExplorer software. Calls were manually identified against species descriptions provided within British Bat Calls: A Guide to Species Identification (Russ 2012).

12.2.3.5.2 Bats - Tree Surveys

Trees located within the footprint of the Proposed Scheme were assessed for their potential to support roosting bats (i.e. Potential Roost Features (PRFs)) as part of the multidisciplinary walkover surveys carried out between June and August 2018, August 2020 and again in March 2022.

A number of trees located across the Proposed Scheme were examined from ground level for the potential to support roosting bats. They were assessed based on the presence of features commonly used by bats. Examples of such features include:

- Natural holes;
- Cracks / splits in major limbs;
- Loose bark; and
- Hollows / cavities.

12.2.3.6 Birds

12.2.3.6.1 Breeding Birds

The results of the desk study have informed the assessment of potential impacts on breeding bird species arising from the Proposed Scheme.

12.2.3.6.2 Nesting Kingfisher Suitability Assessment

The desk study identified one site where water bodies may be subject to significant disturbance (i.e. piling and / or instream works) as a consequence of the Proposed Scheme. This site is located at the proposed Royal Canal pedestrian / cycle bridge crossing.

The suitability of water features and associated foraging, roosting, and nesting habitats, located within or directly adjacent to the Proposed Scheme, were assessed for kingfisher potential. Where suitable habitat existed, surveys extended 500m upstream and downstream of the proposed crossing point. Evidence of previous and current nest holes were recorded. Areas surveyed are shown on Figure 12.1.3 in Volume 3 of this EIAR.

12.2.3.6.3 Wintering Birds

A desk study was carried out to identify any potential suitable inland feeding and / or roosting sites for winter birds located within or directly adjacent to the Proposed Scheme. This included a review of recent aerial photography and known inland feeding sites for the SCI bird species light-bellied Brent goose *Branta bernicla hrota* (Scott Cawley Ltd. 2017). A habitat suitability assessment was carried out in October 2020 to verify the suitability of potential inland feeding / roosting sites identified during the desk study.

The desk study identified one site along or adjacent to the Proposed Scheme with potential for wintering birds that would be subject to direct habitat loss. This was located at Home Farm Football Club pitch on R108 St. Mobhi Road (referred to as CBC0304WB001) (see Figure 12.1.2 in Volume 3 of this EIAR).

Winter bird field surveys were conducted by Scott Cawley Ltd. The site was surveyed during four visits between the months of November 2020 and March 2021. The site was also surveyed over the 2021 / 2022 wintering bird season. Thirteen surveys of the site were conducted between October 2021 and March 2022. The results of the desk study and field surveys have informed the assessment of potential impacts on wintering bird species arising from the Proposed Scheme.

In general, the approach was a 'look-see' methodology (based on Gilbert *et al.* 1998). All birds present within a site were identified with reference to Collins Bird Guide (Svensson 2010) to confirm identification (where necessary) and were recorded using the British Trust for Ornithology (BTO) species codes. The total flock size of birds present, their general location within the site and any activity exhibited were also recorded. Evidence of bird droppings were recorded at pre-defined transect lines. The length of the transect line varied per site. Transect lines were only completed at sites where no bird species were present, to avoid any potential disturbance.

12.2.3.7 Reptiles

The suitability of habitats, located within and immediately adjacent to the Proposed Scheme, were assessed for breeding and / or hibernating reptile species common lizard *Lacerta vivipara*, as part of the multidisciplinary walkover surveys undertaken between June and August 2018 and in August 2020.

12.2.3.8 Amphibians

An assessment of the suitability of surface water features, such as watercourses, drainage ditches and ponds for amphibian species (common frog *Rana temporaria* and smooth newt *Lissotriton vulgaris*) along the footprint of the Proposed Scheme, and suitable lands immediately adjacent, was carried out as part of the multidisciplinary walkover surveys undertaken between June and August 2018 and in August 2020.

12.2.3.9 Fish

Aquatic surveys conducted by Triturus Environmental Ltd., during October and November 2020, comprised of a broad appraisal / overview of the upstream and downstream habitat. The Royal Canal site was deemed not suitable for salmon or lamprey species given the lacustrine-like environment present.

River habitat surveys and fisheries assessments were also carried out utilising elements of the approaches in the River Habitat Survey Methodology (Environment Agency 2003) and Fishery Assessment Methodology (O'Grady 2006) to broadly characterise the river sites (i.e. channel profiles, substrata etc.) (Triturus Environmental Ltd 2020).

12.2.3.10 Invertebrates - White-Clawed Crayfish

White-clawed crayfish surveys were conducted by Triturus Environmental Ltd. during October 2020 under the NPWS license no. C79/2020, as prescribed by Sections 9, 23 and 34 of the Wildlife Acts to capture and release them to their site of capture under condition no. 5 of the licence. As per best practice, crayfish sampling began at the uppermost site on each watercourse / sub-catchment in the study area to prevent the transfer of pathogens or invasive species in an upstream direction. An aquatic biosecurity protocol was also applied for equipment use in water.

Sweep netting and hand-searching (following Reynolds *et al.* 2010) was utilised at each survey site to detect both adult and juvenile crayfish. Sweep netting involves the sampling of more stable refugia such as boulder and cobble accumulations, in addition to macrophyte beds and other potential habitat such as tree root systems. A second operator (with sweep net) was present to capture escape-swimming crayfish observed following the initial sweep or refuge search. To estimate the relative density of crayfish at each site, searches were undertaken (moving upstream) in ten objectively suitable refugia per 1m² to 20m² (metres squared) of habitat (as per Peay 2003). Following capture, all crayfish were held temporarily in a retaining tank containing fresh river water. Each crayfish was sexed, measured (carapace length, to nearest millimetre (mm)) and general condition noted before being released *in-situ*.

A strict biosecurity protocol following the Check-Clean-Dry approach was employed during the survey. Equipment and PPE used was disinfected with Virkon® (a wide spectrum virucidal, bactericidal and fungicidal disinfectant used for biosecurity purposes) between survey sites to prevent the transfer of pathogens and / or invasive species between survey areas. Where feasible, equipment was also thoroughly dried (through ultraviolet (UV) exposure) between survey areas. Particular cognisance was given towards preventing the spread or introduction of crayfish plague (*Aphanomyces astaci*), given the known distribution of a particularly valuable peri-urban population of white-clawed crayfish (*Austropotamobius pallipes*) in the River Camac catchment. As per best practice, surveys

were undertaken at sites in a downstream order (i.e., uppermost site surveyed first etc.) to prevent the upstream mobilisation of invasive propagules and pathogens (Triturus Environmental Ltd. 2020).

12.2.3.11 Aquatic Macro-Invertebrate Survey (Kick-Sampling)

Macro-invertebrate samples were collected by Triturus Environmental Ltd. along the Royal Canal at the Proposed Royal Canal pedestrian / cycle bridge crossing point by kick-sampling. The Royal Canal was deemed unsuitable for Q-sampling (due to a more lacustrine habitat), and thus, a macrophyte sweep was undertaken to collate data on the macro-invertebrate community present. The sample was taken with a standard kick sampling hand net (250mm width, 500µm (micrometre) mesh size) which was used to sweep macrophytes to capture macroinvertebrates. The net was also moved along the canal bed to collect epibenthic and epiphytic invertebrates from the substratum as per Cheal *et al.* (1993). A three-minute sampling period was divided amongst the range of canal meso-habitats present to get the best representative sample. Areas surveyed are shown on Figure 12.1.3 in Volume 3 of this EIAR.

All samples were elutriated and fixed in 70% ethanol for laboratory identification. Any rare invertebrate species were identified from the NPWS Red List publications for beetles, stoneflies, mayflies, and other relevant taxa; Ireland Red List No. 1: Water beetles (Foster *et al.* 2009), Ireland Red List No. 13: Stoneflies (Plecoptera) (Feeley *et al.* 2020) Ireland Red List No. 7: Mayflies (Ephemeroptera) (Kelly-Quinn *et al.* 2012) and Ireland Red List No. 2: Non-Marine Molluscs (Byrne *et al.* 2009).

12.2.4 Appraisal Method for the Assessment of Impacts

The biodiversity and ecological impacts of the Proposed Scheme have been assessed using the following guidelines:

- Environmental Impact Assessment of Projects - Guidance on the preparation of the Environmental Impact Assessment Report (European Commission 2017);
- The EPA Guidelines (EPA 2022);
- EPA Advice Notes (EPA 2015);
- Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment (European Union, 2013);
- CIEEM Guidelines (CIEEM 2018); and
- Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2009).

12.2.4.1 Valuing the Ecological Receptors

Biodiversity receptors (including identified sites of biodiversity importance) have been valued with regard to the ecological valuation examples set out in the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2009). These include International Importance, National Importance, County Importance, and Local Importance.

Habitat areas within Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) are considered in the context of assessing impacts on the conservation objectives and site integrity of a given European site with regard to the Appropriate Assessment (AA) tests set out in Article 6(3) of the Habitats Directive. An AA Screening Report and Natura Impact Statement have been submitted with the application for approval as to enable the Board to carry out the requisite assessments for the purposes of Article 6(3) of the Habitats Directive. For the purposes of the appraisal of likely significant effects on biodiversity arising from the Proposed Scheme, as part of this Chapter of the EIAR, all European sites are valued as Internationally Important.

In accordance with the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2009), biodiversity features within the Zol of the Proposed Scheme which are '*both of sufficient value to be material in decision making and likely to be affected significantly*' are deemed to be KERs. These are the biodiversity receptors which may be subject to likely significant impacts from the Proposed Scheme, either directly or indirectly. KERs are those biodiversity receptors with an ecological value of Local Importance (Higher Value) or greater.

12.2.4.2 Characterising and Describing Impacts

The parameters considered in characterising and describing the magnitude or scale of the likely significant effects of the Proposed Scheme are outlined in Table 12.3.

Table 12.3: Parameters Used to Characterise and Describe the Magnitude or Scale of Potential Impacts

Parameter	Categories
Type of Impact	Positive / Neutral / Negative May also include Cumulative Effects, Do Nothing Effects, Indeterminable Effects, Irreversible Effects, Residual Effects, Synergistic Effects, Indirect Effects and / or Secondary Effects
Extent	The size of the affected area / habitat and / or the proportion of a population affected by the effect
Duration	The period of time over which the effect will occur*.
Frequency and Timing	How often the effect will occur; particularly in the context of relevant life-stages or seasons
Reversibility	Permanent / Temporary Will an impact reverse; either spontaneously or as a result of a specific action

*The following terms / definitions for describing the duration of impacts are provided in the EPA Guidelines (EPA 2022): Momentary Effects - effects lasting from seconds to minutes; Brief Effects - effects lasting less than a day; Temporary Effects - effects lasting less than a year; Short-Term Effects - effects lasting one to seven years; Medium-Term Effects - effects lasting seven to 15 years; Long-Term Effects - effects lasting 15 to 60 years; Permanent Effects - effects lasting over 60 years.

The likelihood of an impact occurring, and the predicted effects, are also an important consideration in characterising impacts. The likelihood of an impact occurring is assessed as being certain, likely or unlikely and; in some cases, it may be possible to definitively conclude that an impact will not occur.

Professional judgement is used in considering the contribution of all relevant criteria in determining the overall magnitude of an impact.

12.2.4.3 Impact Significance

In determining impact significance, the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2009) and the CIEEM Guidelines (CIEEM 2018) were followed, which requires examination of the following two key elements:

- Impact on the integrity of the ecological feature; and
- Impact on its conservation status within a given geographical area.

12.2.4.3.1 Integrity

The term 'integrity' should be regarded as the coherence of ecological structure and function, across the entirety of a site that enables it to sustain all of the biodiversity or ecological resources for which it has been valued (NRA 2009).

The term 'integrity' is most often used when determining impact significance in relation to designated areas for nature conservation (e.g., SACs, SPAs or pNHAs / NHAs but can often be the most appropriate method to use for non-designated areas of biodiversity value where the component habitats and / or species exist within a defined ecosystem at a given geographic scale.

An impact on the integrity of an ecological site or ecosystem is considered to be significant if it moves the condition of the ecosystem away from a favourable condition: removing or changing the processes that support the site's habitats and / or species; affects the nature, extent, structure and functioning of component habitats; and / or affects the population size and viability of component species.

12.2.4.3.2 Conservation Status

The definitions for conservation status given in the Habitats Directive, in relation to habitats and species, are also used in the CIEEM Guidelines (CIEEM 2018) and the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2009):

- For natural habitats, conservation status means the sum of the influences acting on the natural habitat and its typical species, that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species, at the appropriate geographical scale; and
- For species, conservation status means the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations, at the appropriate geographical scale.

An impact on the conservation status of a habitat or species is considered to be significant if it will result in a change in conservation status.

After the definitions provided in the Habitats Directive, the conservation status of a habitat is favourable when:

- Its natural range and areas 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 as defined below under species.

And, the conservation status of a species is favourable 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.

According to the CIEEM Guidelines and the Guidelines for Assessment of Ecological Impacts of National Road Schemes Methodology, if it is determined that the integrity and / or conservation status of an ecological feature will be impacted on, then the level of significance of that impact is related to the geographical scale at which the impact will occur (i.e. local, county, national, international). In some cases, an impact may not be significant at the geographic scale at which the ecological feature has been valued but may be significant at a lower geographical level. For example, a particular impact may not be considered likely to have a negative effect on the overall conservation status of a species which is considered to be Internationally Important. However, an impact may occur at a local level on this Internationally Important species. In this case, the impact on an Internationally Important species is considered to be significant at a Local level only, rather than at an International level.

12.3 Baseline Environment

The Proposed Scheme will be 11km in length and will be comprised of two main alignments in terms of the route it will follow, from Ballymun to the City Centre (the Ballymun Section) and from Finglas to Phibsborough (the Finglas Section).

The Ballymun Section of the Proposed Scheme will commence on R108 Ballymun Road at its junction with St. Margaret's Road, just south of M50 Motorway Junction 4, and will be routed along the R108 on Ballymun Road, St. Mobhi Road, Botanic Road, Prospect Road, Phibsborough Road, Constitution Hill and R132 Church Street as far as R148 Arran Quay at the River Liffey on the western edge of Dublin City Centre. Priority for buses will be provided along the entire route, consisting primarily of dedicated bus lanes in both directions, where feasible, with alternative measures proposed at particularly constrained locations such as at R108 St. Mobhi Road. A complementary cycle route along quiet streets is proposed along Royal Canal Bank in Phibsborough, which will extend southwards from the Royal Canal to Western Way, parallel a short distance to the east of R108 Phibsborough Road, and also through the Markets Area at the southern end of the Proposed Scheme.

The Finglas Section of the Proposed Scheme will commence on the R135 Finglas Road at the junction with R104 St. Margaret's Road and will be routed along the R135 Finglas Road as far as Hart's Corner in Phibsborough, where it will join the Ballymun Section of the Proposed Scheme. Priority for buses will be provided along the entire route, consisting of dedicated bus lanes in both directions. Continuous segregated cycle tracks will be provided from the Church Street Junction in Finglas to Hart's Corner. No cycle tracks are proposed along the Finglas Bypass at the northern end of the Proposed Scheme, where more suitable routes are available along local streets.

A detailed description of the Proposed Scheme is provided in Chapter 4 (Proposed Scheme Description).

The Proposed Scheme includes a variety of suburban and urban features that delineate the established transport corridors. Habitats present at R108 Ballymun Road include dry calcareous and neutral grassland, dry meadows and grassy verges, scrub, watercourses (open and culverted) and treelines associated with undeveloped lands south of the M50 Motorway. As the Ballymun Section will extend southwards from R104 Santry Avenue, buildings and artificial surfaces will dominate with amenity grassland, hedgerows and treelines present as landscaping features along the central reservation. Amenity grassland associated with Balcurris Park will border the west of the Proposed Scheme. As the Proposed Scheme will approach Glasnevin and will extend south to Broadstone, residential areas and buildings and artificial surfaces will continue to dominate and feature mosaics of landscaping habitats including treelines amenity grassland, and scattered trees and parkland. Within a largely urban environment, freshwater habitats are present at the River Tolka and the Royal Canal crossings with associated areas of reed and large sedge swamps, treelines, and amenity grassland. The cycle route as part of the Proposed Scheme will then diverge from the main alignment south of the Royal Canal crossing and will follow the Royal Canal Bank where it will rejoin the main alignment at the junction of R108 Constitution Hill and R135 Western Way. The main alignment of the Proposed Scheme will traverse residential development and buildings and artificial surfaces on the R108 Phibsborough Road, while scattered trees and parkland feature heavily on the cycle route along the Royal Canal Bank. Buildings and artificial surfaces will dominate the Proposed Scheme along R108 Constitution Hill / R132 Church Street until its termination point at R148 Arran Quay. Amongst urban dominated habitats, city landscaping features treelines, amenity grassland and scattered trees and parkland (i.e., King's Inns Park).

Habitats present at R135 Finglas Road include scattered trees and parkland, and broadleaf woodland adjacent to Bachelor's Stream. As the Finglas Section will extend southwards from the R103 Seamus Ennis Road crossroads, the dominant habitats will include residential development and buildings and artificial surfaces. Landscaping habitats are featured along much of the R135 Finglas Road roadside and central reservation including linear woodland, hedgerows, treelines, amenity grassland, and dry meadows and grassy verges. Scattered trees and parkland habitats will dominate as the Finglas Section approaches Tolka Valley Park and borders Glasnevin Cemetery grounds before joining the Ballymun Section at Hart's Corner.

12.3.1 Zone of Influence (Zol)

The Zol, or distance over which a likely significant effect may occur will differ across the KERs, depending on the predicted impacts and the potential impact pathway(s). The results of both the desk study and the suite of ecological field surveys undertaken has established the habitats and species present along the alignment of the Proposed Scheme. The Zol is then informed and defined by the sensitivities of each of the ecological receptors present, in conjunction with the nature and potential impacts associated with the Proposed Scheme. In some instances, the Zol extends beyond the study area as described in Section 12.2.1 (e.g., surface water quality effects of a sufficient magnitude can extend, and affect, receptors at significant distances downstream).

The Zol of the Proposed Scheme in relation to terrestrial habitats is generally limited to the footprint of the Proposed Scheme, and the immediate environs (to take account of shading or other indirect impacts, such as air quality). Hydrological / hydrogeological linkages (e.g., rivers or groundwater flows) between impact sources and wetland / aquatic habitats can often result in impacts occurring at significant distances.

The underlying aquifers are either Locally Important Bedrock Aquifer, Moderately Productive only in Local Zones or Poor Bedrock Aquifer, Moderately Productive only in Local Zones. These types of aquifers are associated with low permeability which decreases with depth. An upper shallow zone of higher permeability may exist in the top few metres and is associated with relatively short flow paths. Therefore, any influence on the groundwater as a result of the Proposed Scheme works will be localised and will not extend to any groundwater dependent habitats which are all located over 400m from any proposed work. This Zol is determined by the professional judgement

of the hydrogeology specialists. This is further discussed with reference to specific construction activities in Chapter 14 (Land, Soils, Geology & Hydrogeology).

A reduction in air quality within the immediate vicinity of the construction works may occur as a consequence of dust deposition associated with these construction activities. This includes a reduction in photosynthesis due to smothering from dust on the plants and chemical changes such as acidity to soils. Furthermore, emissions from car exhausts, and the deposition of particulate matter (PM) and heavy metals (HM) produced by engine, brake, and tyre wear, can contribute to increased deposition of pollutants such as oxides of nitrogen (NO_x, NO_s), volatile organic compounds (VOCs), PM, HM and ammonia (NH₄) in the vicinity of a road carriageway. This can affect the ecosystems and vegetation present, influencing plant growth rates and species composition, diversity, and abundance. The unmitigated Zol for air quality effects arising from the Proposed Scheme has the potential to extend 50m from the Proposed Scheme boundary, and 200m from Construction Compounds during the Construction Phase, and up to 200m the Proposed Scheme boundary during the Operational Phase (see Chapter 7 (Air Quality) for more detail).

With regards to hydrological impacts, the distances over which water-borne pollutants are likely to remain in sufficient concentrations to have a likely significant effect on receiving waters and associated wetland / terrestrial habitat is highly site-specific and related to the predicted magnitude of any potential pollution event. Evidently, it will depend on volumes of discharged waters, concentrations, and types of pollutants (in this case sediment, hydrocarbons, and heavy metals), volumes of receiving waters, and the ecological sensitivity of the receiving waters. In the case of the Proposed Scheme, this includes all estuarine habitats downstream of where the Proposed Scheme will drain to or cross water bodies listed in Table 12.4, and the marine environment of Dublin Bay.

As such, the potential Zol for aquatic plant and animal species includes all estuarine habitats located downstream of where the Proposed Scheme will drain to the proposed crossing points listed in Table 12.4, and the marine environment of Dublin Bay. The Zol for impacts to aquatic fauna species, such as Atlantic salmon and lamprey species, is limited to those watercourses that will be crossed by the Proposed Scheme or water bodies to which runoff from the Proposed Scheme could drain to during construction.

Table 12.4: Water Bodies Hydrologically Connected to the Proposed Scheme and Within its Zol

Water Body Name	Connectivity to the Proposed Scheme
River Santry (Santry_010)	Approximately 200m north of the Proposed Scheme - Surface water connectivity
River Tolka (Tolka_060)	Crosses the Proposed Scheme at one point
Claremont Stream (Tolka_060)	Crosses the Proposed Scheme at one point
Bachelors Stream (Tolka_050)	Crosses the Proposed Scheme at one point
Royal Canal	Crosses the Proposed Scheme at one point
Liffey Estuary Upper	Immediately south (Approximately 50m) of the Proposed Scheme - Surface water connectivity
Liffey Estuary Lower	Immediately downstream of Liffey Estuary Upper - Surface water connectivity
Tolka Estuary	Approximately 1.6km downstream of R108 St. Mobhi Road crossing
Dublin Bay	Approximately 7.5km downstream of R108 St. Mobhi Road crossing and approximately 7.4km downstream from terminus of Proposed Scheme at R148 Arran Quay / Ormond Quay

The Zol for small mammal species, such as the pygmy shrew, would be expected to be limited to no more than approximately 100m from the Proposed Scheme boundary due to their small territory sizes and sedentary lifecycle. The Zol for otters, badgers, stoat, and hedgehogs may extend over greater distances than small mammal species due to their ability to disperse many kilometres from their natal / resting site. The Zol of impacts for significant disturbance impacts to badger and otter breeding / resting places may extend as far as approximately 150m from the Proposed Scheme boundary. This Zol (i.e., approximately 150m from the Proposed Scheme boundary) for badgers and otters has been defined in accordance with the Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes (NRA 2005b) and the Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (NRA 2006b) and is considered to be of a precautionary distance. During construction-related disturbance, the screening effect provided by surrounding vegetation and buildings would likely reduce the actual distance of the Zol for badgers and otters.

The Zol of potential effects to bat roosts would not be expected to exceed approximately 200m in most cases but as effects are dependent on many factors (such as species, roost type, surrounding habitat, commuting routes

etc.), this is assessed on a case by case basis and the ZoI may increase / decrease from this distance accordingly. Given the large foraging ranges for some species, the ZoI of potential landscape scale impacts, such as habitat loss and severance, could extend for several kilometres from the Proposed Scheme but the most significant effects are likely to occur within 1km of important roost sites (e.g., maternity roosts). Leisler's bats have been recorded foraging up to 13km from maternity roost sites (Shiel *et al.* 1999).

The ZoI of the Proposed Scheme in relation to likely significant effects on most breeding bird species is generally limited to habitat loss within the footprint of the Proposed Scheme and disturbance / displacement during construction, and disruption in territorial singing due to noise during operation. Disturbance effects may extend for several hundreds of metres from the Proposed Scheme.

The ZoI in relation to indirect impacts to wintering birds could extend up to approximately 300m from the Proposed Scheme for general construction activities, as many species (such as waterbirds) are highly susceptible to disturbance from loud and unpredictable noise during construction. However, as many estuarine bird species use inland habitat areas at distances from the coast, the ZoI for *ex-situ* impacts could extend a considerable distance from the Proposed Scheme. In the case of the Proposed Scheme, impacts to wintering birds within this 300m band could affect the use of potential *ex-situ* sites for bird species listed as SCIs of European sites.

Current understanding of construction related noise disturbance to wintering waterbirds is based on the research presented in Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance (Cutts *et al.* 2009) and Exploring Behavioural Responses of Shorebirds to Impulsive Noise (Wright *et al.* 2010). In terms of construction noise, levels below 50dB (decibels) would not be expected to result in any response from foraging or roosting birds. Noise levels between 50dB and 70dB would provoke a moderate effect / level of response from birds (i.e., birds becoming alert and some behavioural changes (e.g., reduced feeding activity)), but birds are expected to habituate to noise levels within this range. Noise levels above 70dB would likely result in birds moving out of the affected zone or leaving the site altogether. At approximately 300m, typical noise levels associated with construction activity (British Standard Institution (BSI) British Standard (BS) 5228-1:2009 +A1:2014 Code of Practice for noise and vibration control of construction and open sites - Part 1: Noise (hereafter referred to BS 5228-1) (BSI 2008)) are generally below 60dB or, in most cases, are approaching the 50dB threshold.

The ZoI in relation to amphibian species is likely to be limited to direct habitat loss and severance within the Proposed Scheme boundary and / or indirect impacts to water quality in wetland habitats hydrologically connected to the Proposed Scheme.

The ZoI in relation to the common lizard is likely to be limited to direct habitat loss and severance within and across the Proposed Scheme boundary and disturbance / displacement effects in the immediate vicinity during construction.

12.3.2 Desk Study

The results of the desk study review are provided in Appendix A12.1 in Volume 4 of this EIAR and are incorporated into the sections below under the various headings, as relevant.

12.3.3 Biodiversity Areas

The Fingal Biodiversity Action Plan 2010 - 2015 highlights a number of areas considered to be of biodiversity value present within the boundaries of Fingal County Council (Fingal County Council 2010). These areas that are located within the ZoI of the Proposed Scheme are provided below:

- Habitats considered to be of importance, such as arable land, semi-natural grasslands, hedgerows and woodlands, which support a range of species and act as important ecological links / corridors across the wider landscape. Woodlands in Fingal County Council administrative territory were largely planted during the 18th century and may be part of the ancient woodland cover in Dublin;
- Hedgerows providing food, shelter and nesting sites in the agricultural landscape. They also act as ecological links or corridors across habitat types. There is about 2,660km of hedgerow in Fingal County Council administrative territory, most of which are located in the north and west of the County;

- Network of rivers and streams (Table 12.4), including the River Tolka, which will be crossed by the Proposed Scheme. These watercourses support a range of riverine bird species, such as kingfisher *Alcedo atthis*, and fish species;
- Green spaces providing valuable wildlife habitats scattered across parkland and gardens including Corduff Park, Waterville Park, playing fields, and golf clubs; and
- The Royal Canal will be crossed by the Proposed Scheme. The Fingal Biodiversity Action Plan 2010 - 2015 identifies the Royal Canal as a multi-functional amenity corridor. The Royal Canal is a pNHA and supports coarse fish species, including roach *Rutilus*, pike *Esox lucius*, rudd *Scardinius erythrophthalmus*, bream *Abramis brama* and tench *Tinca tinca*, and the legally-protected Flora Protection Order species opposite-leaved pondweed *Groenlandia densa* as well as the endangered Red List freshwater snail species glutinous snail *Myxas glutinosa*. Otter *Lutra lutra* activity is often found where the canal crosses with streams and rivers throughout the city.

The Dublin City Biodiversity Action Plan 2015 - 2020 (DCC 2015) highlights a number of areas considered to be of biodiversity value present within the administrative boundaries of DCC. These areas that are located within the Zol of the Proposed Scheme are provided below:

- Dublin City's Green Infrastructure Network. Habitats within the Proposed Scheme which are considered to contribute to the Green Infrastructure Network include hedgerows, treelines, and woodlands, which support a range of species and act as ecological links / corridors across the wider landscape. Dublin City's network of parks and public green spaces, such as Tolka Valley Park and private gardens, support a variety of species and are considered to be a valuable biodiversity resource;
- Dublin City's network of rivers, streams, and riparian zones. The Proposed Scheme is hydrologically connected to the River Tolka and the River Santry. These watercourses support a range of riparian bird species, such as kingfisher, and fish species. The Proposed Scheme will terminate at the Liffey Estuary Upper at R148 Arran Quay. The River Liffey is noted as being a highly significant regional salmonid catchment for species of Atlantic salmon *Salmo salar* and brown trout *Salmo trutta*. It also supports an active otter population; and
- The Royal Canal will be crossed by the Proposed Scheme at R108 Phibsborough Road, and this will include a new proposed pedestrian / cycle bridge crossing. It is noted as an important aspect of Dublin City's Green Infrastructure network, linking the River Shannon to Dublin Bay. It is a pNHA and also supports coarse fish species, including roach *Rutilus rutilus*, pike *Esox lucius*, rudd *Scardinius erythrophthalmus*, bream *Abramis brama* and tench *Tinca tinca*, and has been noted for its botanical diversity.

Local biodiversity areas listed above are considered under the relevant flora and / or fauna KERs that rely on these areas in the overall EIAR biodiversity assessment.

12.3.4 Designated Areas for Nature Conservation

12.3.4.1 European sites

The Proposed Scheme will not overlap with any European site. The nearest European site is South Dublin Bay and River Tolka Estuary SPA, followed by South Dublin Bay SAC, which are located approximately 2.7km and 4km east of the Proposed Scheme, respectively.

There are eight European sites located in Dublin Bay that are downstream of the Proposed Scheme. These European sites are North Dublin Bay SAC, South Dublin Bay SAC, Howth Head SAC, Rockabill to Dalkey Island SAC, North Bull Island SPA, South Dublin Bay and River Tolka SPA, Howth Head Coast SPA, and Dalkey Island SPA. European sites will be hydrologically connected to the Proposed Scheme via the River Santry, River Tolka, Claremont Stream, Bachelors Stream, Royal Canal, and Liffey Estuary Upper.

There are two European sites containing marine mammals which are known to frequent Dublin Bay and the Liffey Estuary Lower, namely Rockabill to Dalkey Island SAC and Lambay Island SAC.

There are thirteen SPAs designated for SCI species that are known to forage and / or roost at inland sites across Dublin City. These are Malahide Estuary SPA, Baldoyle Bay SPA, Rogerstown Estuary SPA, Skerries Islands

SPA, North Bull Island SPA, South Dublin Bay and River Tolka SPA, Ireland's Eye SPA, Lambay Island SPA, Howth Head Coast SPA, Dalkey Islands SPA, Rockabill SPA, Wicklow Mountains SPA and The Murrrough SPA.

There are 25 European sites (SACs or SPAs) located within the vicinity of the Proposed Scheme. These are listed in Table 12.5 and illustrated in Figure 12.3 in Volume 3 of this EIAR. Table 12.5 lists these sites, their distance from the Proposed Scheme, and the sites' designations (QIs / SCIs). There are 17 of these European sites located within the Zol of the Proposed Scheme (see Table 12.5).

These European sites are valued as being of International Importance.

Table 12.5: European Sites (SACs and SPAs) Located with the Zol (highlighted in light blue), and those in the Wider Area of the Proposed Scheme Boundary.

Site Name	Distance	Designation – QIs or SCIs
SACs		
South Dublin Bay SAC [000210]	Approximately 4km south east of Proposed Scheme	<p>Annex I Habitats:</p> <ul style="list-style-type: none"> • Mudflats and sandflats not covered by seawater at low tide [1140]; • Annual vegetation of drift lines [1210]; • <i>Salicornia</i> and other annuals colonising mud and sand [1310]; and • Embryonic shifting dunes [2110]. <p>S.I. No. 525/2019 – European Union Habitats (South Dublin Bay Special Area of Conservation 000210) Regulations 2019</p> <p>Source: Conservation Objectives: South Dublin Bay SAC 000210. Version 1. (NPWS 2013a) and Natura 2000 – Standard Data Form (NPWS 2020a)</p>
North Dublin Bay SAC [000206]	Approximately 5.7km east of Proposed Scheme	<p>Annex I Habitats:</p> <ul style="list-style-type: none"> • Mudflats and sandflats not covered by seawater at low tide [1140]; • Annual vegetation of drift lines [1210]; • <i>Salicornia</i> and other annuals colonising mud and sand [1310]; • Atlantic salt meadows (<i>Glauco - Puccinellietalia maritimae</i>) [1330]; • Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]; • Embryonic shifting dunes [2110]; • Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ('white dunes') [2120]; • Fixed coastal dunes with herbaceous vegetation ('grey dunes')* [2130]; and • Humid dune slacks [2190]. <p>Annex II Species:</p> <ul style="list-style-type: none"> • Petalwort <i>Petalophyllum ralfsii</i> [1395]. <p>S.I. No. 524/2019 – European Union Habitats (North Dublin Bay Special Area of Conservation 000206) Regulations 2019</p> <p>Source: Conservation Objectives: North Dublin Bay SAC 000206. Version 1. (NPWS 2013b) and Natura 2000 – Standard Data Form (NPWS 2020b)</p>
Malahide Estuary SAC [000205]	Approximately 7.6km north east of Proposed Scheme	<p>Annex I Habitats:</p> <ul style="list-style-type: none"> • Mudflats and sandflats not covered by seawater at low tide [1140]; • <i>Salicornia</i> and other annuals colonising mud and sand [1310]; • Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330]; • Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]; • Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]; and • Fixed coastal dunes with herbaceous vegetation (grey dunes)* [2130]. <p>S.I. No. 525/2019 – European Union Habitats (South Dublin Bay Special Area of Conservation 000210) Regulations 2019</p> <p>Source: Conservation Objectives: Malahide Estuary SAC 000205. Version 1. (NPWS 2013c) and Natura 2000 – Standard Data Form (NPWS 2020c)</p>
Baldoyle Bay SAC [000199]	Approximately 8km north east	<p>Annex I Habitats:</p>

Site Name	Distance	Designation – QIs or SCIs
	of Proposed Scheme	<ul style="list-style-type: none"> Mudflats and sandflats not covered by seawater at low tide [1140]; <i>Salicornia</i> and other annuals colonising mud and sand [1310]; Atlantic salt meadows (<i>Glauco - Puccinellietalia maritimae</i>) [1330]; and Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]. <p>S.I. No. 472/2021 - European Union Habitats (Baldoyle Bay Special Area of Conservation 000199) Regulations 2021</p> <p>Source: Conservation Objectives: Baldoyle Bay SAC 000199. Version 1. (NPWS 2012b) and Natura 2000 – Standard Data Form (NPWS 2018a)</p>
Howth Head SAC [000202]	Approximately 11km east of the Proposed Scheme	<p>Annex I Habitats:</p> <ul style="list-style-type: none"> Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]; and European dry heaths [4030]. <p>S.I. No. 524/2021 - European Union Habitats (Howth Head Special Area of Conservation 000202) Regulations 2021</p> <p>Source: Conservation Objectives: Howth Head SAC 000202. Version 1. (NPWS 2016) and Natura 2000 – Standard Data Form (NPWS 2018b)</p>
Rogerstown Estuary SAC [000208]	Approximately 11.3km north east of the Proposed Scheme	<p>Annex I Habitats:</p> <ul style="list-style-type: none"> Estuaries [1130]; Mudflats and sandflats not covered by seawater at low tide [1140]; <i>Salicornia</i> and other annuals colonising mud and sand [1310]; Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) [1330]; Mediterranean salt meadows (<i>Juncetalia maritimi</i>) [1410]; Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) [2120]; and Fixed coastal dunes with herbaceous vegetation (grey dunes)* [2130]. <p>S.I. No. 268/2018 - European Union Habitats (Rogerstown Estuary Special Area of Conservation 000208) Regulations 2018</p> <p>Source: Conservation Objectives: Rogerstown Estuary SAC 000208. Version 1. (NPWS, 2013d) and Natura 2000 – Standard Data Form (NPWS 2019d)</p>
Glenasmole Valley SAC [001209]	Approximately 11.4km south of Proposed Scheme	<p>Annex I Habitats:</p> <ul style="list-style-type: none"> Semi-natural dry grasslands and scrubland facies on calcareous substrates (<i>Festuco-Brometalia</i>) (* important orchid sites) [6210]; <i>Molinia</i> meadows on calcareous, peaty, or clayey-silt-laden soils (<i>Molinia caeruleae</i>) [6410]; and Petrifying springs with tufa formation (<i>Cratoneurion</i>)* [7220]. <p>S.I. No. 345/2021 - European Union Habitats (Glenasmole Valley Special Area of Conservation 001209) Regulations 2021</p> <p>Source: Conservation objectives for Glenasmole Valley SAC [001209]. Version 1.0. DHLGH (NPWS 2021c) and Natura 2000 – Standard Data Form (NPWS 2018c)</p>
Rockabill to Dalkey Island SAC [003000]	Approximately 11.7km east of the Proposed Scheme	<p>Annex I Habitats:</p> <ul style="list-style-type: none"> Reefs [1170]. <p>Annex II Species:</p> <ul style="list-style-type: none"> Harbour porpoise <i>Phocoena phocoena</i> [1351]. <p>S.I. No. 94/2019 – European Union Habitats (Rockabill To Dalkey Island Special Area Of Conservation 003000) Regulations 2019</p> <p>Source: Conservation Objectives: Rockabill to Dalkey Island SAC 003000. Version 1. (NPWS 2013e) and Natura 2000 – Standard Data Form (NPWS 2019e)</p>
Wicklow Mountains SAC [002122]	Approximately 11.9km south of Proposed Scheme	<p>Annex I Habitats:</p> <ul style="list-style-type: none"> Oligotrophic waters containing very few minerals of sandy plains (<i>Littorelletalia uniflorae</i>) [3110]; Natural dystrophic lakes and ponds [3160];

Site Name	Distance	Designation – QIs or SCIs
		<ul style="list-style-type: none"> Northern Atlantic wet heaths with <i>Erica tetralix</i> [4010]; European dry heaths [4030]; Alpine and Boreal heaths [4060]; Calaminarian grasslands of the <i>Violetalia calaminariae</i> [6130]; Species-rich <i>Nardus</i> grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe) [6230]; Blanket bogs (* if active bog) [7130]; Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) [8110]; Calcareous rocky slopes with chasmophytic vegetation [8210]; Siliceous rocky slopes with chasmophytic vegetation [8220]; and Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles [91A0]. <p>Annex II Species:</p> <ul style="list-style-type: none"> Otter <i>Lutra lutra</i> [1355]. <p>Source: Conservation Objectives: Wicklow Mountains SAC 002122. Version 1. (NPWS 2017a) and Natura 2000 – Standard Data Form (NPWS 2018d)</p>
Rye Water Valley/Carton SAC [001398]	Approximately 12.6km west of the Proposed Scheme	<p>Annex I Habitats</p> <ul style="list-style-type: none"> Petrifying springs with tufa formation (<i>Cratoneurion</i>)* [7220] <p>Annex II Species</p> <ul style="list-style-type: none"> Narrow-mouthed Whorl Snail <i>Vertigo angustior</i> [1014] Desmoulin's Whorl Snail <i>Vertigo moulinsiana</i> [1016] <p>S.I. No. 494/2018 - European Union Habitats (Rye Water Valley/Carton Special Area of Conservation 001398) Regulations 2018</p> <p>NPWS (2021) Conservation objectives for Rye Water Valley/Carton SAC [001398]. Version 1.0. Department of Housing, Local Government and Heritage.</p>
Ireland's Eye SAC [002193]	Approximately 12.9km east of the Proposed Scheme	<p>Annex I Habitats:</p> <ul style="list-style-type: none"> Perennial vegetation of stony banks [1220]; and Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]. <p>S.I. No. 501/2017 – European Union Habitats (Ireland's Eye Special Area of Conservation 002193) Regulations 2017</p> <p>Source: Conservation Objectives: Ireland's Eye SAC 002193. Version 1. (NPWS 2017b) and Natura 2000 – Standard Data Form (NPWS 2020d)</p>
Ireland's Eye SAC [002193]	Approximately 12.9km east of the Proposed Scheme	<p>Annex I Habitats:</p> <ul style="list-style-type: none"> Reefs [1170]; and Vegetated sea cliffs of the Atlantic and Baltic coasts [1230]. <p>Annex II Species:</p> <ul style="list-style-type: none"> Grey seal <i>Halichoerus grypus</i> [1364]; and Harbour seal <i>Phoca vitulina</i> [1365]. <p>S.I. No. 294/2019 - European Union Habitats (Lambay Island Special Area of Conservation 000204) Regulations 2019</p> <p>Source: Conservation objectives for Lambay Island SAC [000204]. Version 1.0. (NPWS 2013f) and Natura 2000 – Standard Data Form (NPWS 2019f)</p>
SPAs		
South Dublin Bay and River Tolka Estuary SPA [004024]	Approximately 2.7km south east of the Proposed Scheme	<ul style="list-style-type: none"> Light-bellied Brent Goose <i>Branta bernicla hrota</i> [A046]; Oystercatcher <i>Haematopus ostralegus</i> [A130]; Ringed Plover <i>Charadrius hiaticula</i> [A137]; Grey Plover <i>Pluvialis squatarola</i> [A140]; Knot <i>Calidris canutus</i> [A143]; Sanderling <i>Calidris alba</i> [A144]; Dunlin <i>Calidris alpina</i> [A149]; Bar-tailed Godwit <i>Limosa lapponica</i> [A157]; Redshank <i>Tringa totanus</i> [A162];

Site Name	Distance	Designation – QIs or SCIs
		<ul style="list-style-type: none"> Black-headed Gull <i>Chroicocephalus ridibundus</i> [A179]; Roseate Tern <i>Sterna dougallii</i> [A192]; Common Tern <i>Sterna hirundo</i> [A193]; Arctic Tern <i>Sterna paradisaea</i> [A194]; and Wetlands and Waterbirds [A999]. <p>S.I. No. 212/2010 – European Communities (Conservation of Wild Birds (South Dublin Bay and River Tolka Estuary Special Protection Area 004024) Regulations 2010</p> <p>Source: Conservation Objectives: South Dublin Bay and River Tolka Estuary SPA 004024. Version 1. (NPWS 2015a) and Natura 2000 – Standard Data Form (NPWS 2020e)</p>
North Bull Island SPA [004006]	Approximately 5.7km east of the Proposed Scheme	<ul style="list-style-type: none"> Light-bellied Brent Goose <i>Branta bernicla hrota</i> [A046]; Shelduck <i>Tadorna tadorna</i> [A048]; Teal <i>Anas crecca</i> [A052]; Pintail <i>Anas acuta</i> [A054]; Shoveler <i>Anas clypeata</i> [A056]; Oystercatcher <i>Haematopus ostralegus</i> [A130]; Golden Plover <i>Pluvialis apricaria</i> [A140]; Grey Plover <i>Pluvialis squatarola</i> [A141]; Knot <i>Calidris canutus</i> [A143]; Sanderling <i>Calidris alba</i> [A144]; 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 tetanus</i> [A162]; Turnstone <i>Arenaria interpres</i> [A169]; Black-headed Gull <i>Chroicocephalus ridibundus</i> [A179]; and Wetlands and Waterbirds [A199]. <p>S.I. No. 211/2010 – European Communities (Conservation of Wild Birds (North Bull Island Special Protection Area 004006) Regulations 2010</p> <p>Source: Conservation Objectives: North Bull Island SPA 004006. Version 1. (NPWS 2015b) and Natura 2000 – Standard Data Form (NPWS 2020f)</p>
Malahide Estuary SPA [004025]	Approximately 7.7km north east of Proposed Scheme	<ul style="list-style-type: none"> Great Crested Grebe <i>Podiceps cristatus</i> [A005]; Light-bellied Brent Goose <i>Branta bernicla hrota</i> [A046]; Shelduck <i>Tadorna tadorna</i> [A048]; Pintail <i>Anas acuta</i> [A054]; Goldeneye <i>Bucephala clangula</i> [A067]; Red-breasted Merganser <i>Mergus serrator</i> [A069]; Oystercatcher <i>Haematopus ostralegus</i> [A130]; Golden Plover <i>Pluvialis apricaria</i> [A140]; Grey Plover <i>Pluvialis squatarola</i> [A141]; Knot <i>Calidris canutus</i> [A143]; Dunlin <i>Calidris alpina</i> [A149]; Black-tailed Godwit <i>Limosa limosa</i> [A156]; Bar-tailed Godwit <i>Limosa lapponica</i> [A157]; Redshank <i>Tringa totanus</i> [A162]; and Wetland and Waterbirds [A999]. <p>S.I. No. 285/2011 – European Communities (Conservation of Wild Birds (Malahide Estuary Special Protection Area 004025) Regulations 2011</p> <p>Sources: Conservation Objectives: Malahide Estuary SPA 004025. Version 1. (NPWS 2013g) and Natura 2000 – Standard Data Form (NPWS 2020g)</p>
Baldoye Bay SPA [004016]	Approximately 8.2km north east of	<ul style="list-style-type: none"> Light-bellied Brent Goose <i>Branta bernicla hrota</i> [A046]; Shelduck <i>Tadorna tadorna</i> [A048]; Ringed Plover <i>Charadrius hiaticula</i> [A137];

Site Name	Distance	Designation – QIs or SCIs
	Proposed Scheme	<ul style="list-style-type: none"> Golden Plover <i>Pluvialis apricaria</i> [A140]; Grey Plover <i>Pluvialis squatarola</i> [A141]; Bar-tailed Godwit <i>Limosa lapponica</i> [A157]; and Wetlands and Waterbirds [A999]. <p>Sources: Conservation Objectives: Baldoyle Bay SPA 004016. Version 1. (NPWS 2013h) and Natura 2000 – Standard Data Form (NPWS 2020h)</p>
Rogerstown Estuary SPA [004015]	Approximately 11.7km north-east of Proposed Scheme	<ul style="list-style-type: none"> Greylag Goose <i>Anser anser</i> [A043]; Light-bellied Brent Goose <i>Branta bernicla hrota</i> [A046]; Shelduck <i>Tadorna tadorna</i> [A048]; Shoveler <i>Anas clypeata</i> [A056]; Oystercatcher <i>Haematopus ostralegus</i> [A130]; Ringed Plover <i>Charadrius hiaticula</i> [A137]; Grey Plover <i>Pluvialis squatarola</i> [A141]; Knot <i>Calidris canutus</i> [A143]; Dunlin <i>Calidris alpina</i> [A149]; Black-tailed Godwit <i>Limosa limosa</i> [A156]; Redshank <i>Tringa totanus</i> [A162]; and Wetland and Waterbirds [A999]. <p>S.I. No. 275/2010 – European Communities (Conservation of Wild Birds (Baldoyle Bay Special Protection Area 004016) Regulations 2010</p> <p>Source: Conservation Objectives: Rogerstown Estuary SPA 004015. Version 1. (NPWS, 2013i) and Natura 2000 – Standard Data Form (NPWS 2020i)</p>
Wicklow Mountains SPA [004040]	Approximately 12km south of the Proposed Scheme	<ul style="list-style-type: none"> Merlin <i>Falco columbarius</i> [A098]; and Peregrine <i>Falco peregrinus</i> [A103]. <p>S.I. No. 586/2012 – European Communities (Conservation of Wild Birds (Wicklow Mountains Special Protection Area 004040) Regulations 2012</p> <p>Source: Conservation Objectives: Wicklow Mountains SPA 004040. Generic Version 9.0. (NPWS 2022a) and Natura 2000 – Standard Data Form (NPWS 2020j)</p>
Ireland's Eye SPA [004117]	Approximately 12.7km east of Proposed Scheme	<ul style="list-style-type: none"> Cormorant <i>Phalacrocorax carbo</i> [A017]; Herring Gull <i>Larus argentatus</i> [A184]; Kittiwake <i>Rissa tridactyla</i> [A188]; Guillemot <i>Uria aalge</i> [A199]; and Razorbill <i>Alca torda</i> [A200]. <p>S.I. No. 240/2010 – European Communities (Conservation of Wild Birds (Ireland's Eye Special Protection Area 004117) Regulations 2010</p> <p>Source: Conservation objectives for Ireland's Eye SPA [004117]. Generic Version 9.0. (NPWS 2022b) and Natura 2000 – Standard Data Form (NPWS 2020k)</p>
Howth Head Coast SPA [004113]	Approximately 13.8km east of the Proposed Scheme	<ul style="list-style-type: none"> Kittiwake <i>Rissa tridactyla</i> [A188]. <p>S.I. No. 185/2012 – European Communities (Conservation of Wild Birds (Howth Head Coast Special Protection Area 004113)) Regulations 2012</p> <p>Source: Conservation objectives for Howth Head Coast SPA [004113]. Generic Version 9.0. (NPWS 2022c) and Natura 2000 – Standard Data Form (NPWS 2020l)</p>
Dalkey Island SPA [004172]	Approximately 13.9km south east of the Proposed Scheme	<ul style="list-style-type: none"> Roseate Tern <i>Sterna dougallii</i> [A192]; Common Tern <i>Sterna hirundo</i> [A193]; and Arctic Tern <i>Sterna paradisaea</i> [A194]. <p>S.I. No. 238/2010 – European Communities (Conservation of Wild Birds (Dalkey Islands Special Protection Area 004172)) Regulations 2010</p>

Site Name	Distance	Designation – QIs or SCIs
		Source: Conservation Objectives for Dalkey Islands SPA [004172]. Generic Version 9.0. (NPWS 2022d) and Natura 2000 – Standard Data Form (NPWS 2020m)
Lambay Island SPA [004069]	Approximately 17.8km from the Proposed Scheme	<ul style="list-style-type: none"> • Cormorant <i>Phalacrocorax carbo</i> [A017]; • Shag <i>Phalacrocorax aristotelis</i> [A018]; • Greylag Goose <i>Anser anser</i> [A043]; • Lesser Black-backed Gull <i>Larus fuscus</i> [A183]; • Herring Gull <i>Larus argentatus</i> [A184]; • Kittiwake <i>Rissa tridactyla</i> [A188]; • Guillemot <i>Uria aalge</i> [A199]; • Razorbill <i>Alca torda</i> [A200]; and • Puffin <i>Fratercula arctica</i> [A204]. <p>S.I. No. 242/2010 – European Communities (Conservation of Wild Birds (Lambay Island Special Protection Area 004069)) Regulations 2010</p> <p>Source: Conservation objectives for Lambay Island SPA [004069]. Generic Version 9.0. (NPWS, 2022e) and Natura 2000 – Standard Data Form (NPWS 2020o)</p>
Skerries Islands SPA [004122]	Approximately 21.5km north east of the Proposed Scheme	<ul style="list-style-type: none"> • Cormorant <i>Phalacrocorax carbo</i> [A017]; • Shag <i>Phalacrocorax aristotelis</i> [A018]; • Light-bellied Brent Goose <i>Branta bernicla hrota</i> [A046]; • Purple Sandpiper <i>Calidris maritima</i> [A148]; • Turnstone <i>Arenaria interpres</i> [A169]; and • Herring Gull <i>Larus argentatus</i> [A184]. <p>S.I. No. 245/2010 – European Communities (Conservation of Wild Birds (Skerries Islands Special Protection Area 004122)) Regulations 2010.</p> <p>Source: Conservation objectives for Skerries Islands SPA [004122]. Generic Version 9.0. (NPWS, 2022f) and Natura 2000 – Standard Data Form (NPWS 2020n)</p>
Rockabill SPA [004014]	Approximately 22.4km north east of the Proposed Scheme	<ul style="list-style-type: none"> • Purple Sandpiper <i>Calidris maritima</i> [A148]; • Roseate Tern <i>Sterna dougallii</i> [A192]; • Common Tern <i>Sterna hirundo</i> [A193]; and • Arctic Tern <i>Sterna paradisaea</i> [A194]. <p>S.I. No. 94/2012 – European Communities (Conservation of Wild Birds (Rockabill Special Protection Area 004014)) Regulations 2012</p> <p>Source: Conservation Objectives: Rockabill SPA [004014]. Version 1. (NPWS, 2013j) and Natura 2000 – Standard Data Form (NPWS, 2020p)</p>
The Murrough SPA [004186]	Approximately 30.8km south of the Proposed Scheme	<ul style="list-style-type: none"> • Red-throated Diver <i>Gavia stellata</i> [A001]; • Greylag Goose <i>Anser anser</i> [A043]; • Light-bellied Brent Goose <i>Branta bernicla hrota</i> [A046]; • Wigeon <i>Anas penelope</i> [A050]; • Teal <i>Anas crecca</i> [A052]; • Black-headed Gull <i>Chroicocephalus ridibundus</i> [A179]; • Herring Gull <i>Larus argentatus</i> [A184]; and • Little Tern <i>Sterna albifrons</i> [A195]. <p>S.I. No. 298/2011 – European Communities (Conservation of Wild Birds (The Murrough Special Protection Area 004186)) Regulations 2011</p> <p>Source: Conservation Objectives: The Murrough SPA 004186. Generic Version 9.0. (NPWS, 2022g) and Natura 2000 – Standard Data Form (NPWS 2020q)</p>

12.3.4.2 Natural Heritage Areas (NHAs) and Proposed Natural Heritage Areas (pNHAs)

NHAs are designations under Section 18 of the Wildlife (Amendment) Act 2000 to protect habitats, species, or geology of National Importance.

In addition to NHAs, pNHAs which are also sites of significance for wildlife and habitats were published on a non-statutory basis in 1995 but have not since been statutorily proposed or designated. pNHAs are offered protection in the interim period under the county or city development plans which require that planning authorities give due

regard to their protection in planning policies and decisions. The Proposed Scheme lies within the administrative boundaries of the Dublin City Development Plan 2016 - 2022 (DCC 2016) and the Fingal Development Plan 2017 - 2023 (FCC 2017).

Many of the pNHA sites, and some of the NHAs in Ireland overlap with the boundaries of European sites.

The closest nationally designated site to the Proposed Scheme is the Royal Canal pNHA, which will be traversed by the Proposed Scheme at R108 Phibsborough Road, Royal Canal Bank. Following this is Santry Demesne pNHA, which is located approximately 0.5km east of the Proposed Scheme, and the Grand Canal pNHA, which is located approximately 1.7km south of the Proposed Scheme.

There are six pNHAs that are located downstream of the Proposed Scheme in Dublin Bay. These pNHAs are North Dublin Bay pNHA, Dolphins, Dublin Docks pNHA, Booterstown Marsh pNHA, Howth Head pNHA, Dalkey Coastal Zone and Killiney Hill pNHA, and South Dublin Bay pNHA. These sites are hydrologically connected to the Proposed Scheme via the River Santry, River Tolka, Bachelors Stream, the Royal Canal, and the Liffey Estuary Upper. Santry Demesne pNHA is located approximately 600m downstream of the Proposed Scheme and is hydrologically connected via the River Santry.

There is one NHA and 12 pNHAs designated for wintering bird species that are known to forage and / or roost at inland sites across Dublin City. These include Skerries Islands NHA, Malahide Estuary pNHA, Baldoyle Bay pNHA, Rogerstown pNHA, North Dublin Bay pNHA, South Dublin Bay pNHA, Dolphins, Dublin Docks pNHA, Booterstown Marsh pNHA, Dalkey Coastal Zone and Killiney Hill pNHA, Ireland's Eye pNHA, Lambay Island pNHA, Portraine Shore pNHA and The Murrrough pNHA.

There is one NHA and 28 pNHAs located within the vicinity of the Proposed Scheme. These are listed in Table 12.6 and illustrated in Figure 12.4 in Volume 3 of this EIAR. Table 12.6 lists these sites, their distance from the Proposed Scheme, and the ecological features for which the sites are designated / proposed. Sixteen of these are located within the Zol of the Proposed Scheme.

These pNHAs are valued as being of National Importance.

Table 12.6: NHAs and pNHAs located Within the Zol of Proposed Scheme Boundary (highlighted in light blue), and those in the Wider Area, of the Proposed Scheme Boundary

Site Name	Distance	Designation
NHAs		
Skerries Islands NHA [001218]	Approximately 21.5km north east of the Proposed Scheme	Listed under similar conservation objectives as its SPA designation. See Table 12.5 under Skerries Islands SPA
pNHAs		
Royal Canal pNHA [002103]	Traverses the Proposed Scheme	Diversity of species canal supports and presence of a legally protected plant species, opposite-leaved pondweed <i>Groenlandia densa</i>
Santry Demesne pNHA [000178]	Approximately 0.5km east of Proposed Scheme	Presence of legally protected plant species, hairy St. John's-wort <i>Hypericum hirsutum</i> , and woodland habitat
Grand Canal pNHA [002104]	Approximately 1.7km south of the Proposed Scheme	Diversity of species canal supports and presence of a legally protected plant species, opposite-leaved pondweed <i>Groenlandia densa</i>
North Dublin Bay pNHA [000206]	Approximately 2.5km east of Proposed Scheme	Listed under similar conservation objectives as its SAC and SPA designations. See Table 12.5 under North Dublin Bay SAC, North Bull Island SPA and South Dublin Bay and River Tolka Estuary SPA

Site Name	Distance	Designation
South Dublin Bay pNHA [000210]	Approximately 4km south of the Proposed Scheme	Listed under similar conservation objectives as its SAC and SPA designations. See Table 12.5 under South Dublin Bay SAC and South Dublin Bay and River Tolka Estuary SPA
Liffey Valley pNHA [000128]	Approximately 4.9km west of the Proposed Scheme	Presence of legally protected plant species, hairy St. John's-wort <i>Hypericum hirsutum</i> , rare Red List plant species green figwort <i>Scrophularia umbrosa</i> and yellow archangel <i>Lamiastrum galeobdolon</i> and the diversity of habitat present.
Dolphins, Dublin Docks pNHA [000201]	Approximately 5km south east of the Proposed Scheme	Listed under similar conservation objectives as its SPA designations. See Table 12.5 under South Dublin Bay and River Tolka Estuary SPA
Feltrim Hill pNHA [001208]	Approximately 5.7km north east of the Proposed Scheme	Good example of knoll-reef phenomenon. Previously known to contain two rare plant species, namely spring squill <i>Scilla verna</i> and long-stalked crane's-bill <i>Geranium columbinum</i>
Boosterstown Marsh pNHA [001205]	Approximately 6.1km south east of the Proposed Scheme	See Table 12.5 under South Dublin Bay and River Tolka Estuary SPA
Dodder Valley pNHA [000991]	Approximately 7.3km south of Proposed Scheme	The last remaining stretch of natural river bank vegetation on the River Dodder in the built-up Greater Dublin Area.
Malahide Estuary pNHA [000205]	Approximately 7.7km north-east of the Proposed Scheme	Listed under similar conservation objectives as its SAC and SPA designations. See Table 12.5 under Malahide Estuary SAC and Malahide Estuary SPA
Sluice River Marsh pNHA [001763]	Approximately 7.8km west of the Proposed Scheme	Freshwater marsh
Baldoyle Bay pNHA [000199]	Approximately 8.1km east of Proposed Scheme	Listed under similar conservation objectives as its SAC and SPA designations. See Table 12.5 under Baldoyle Bay SAC and Baldoyle Bay SPA
Fitzsimon's Wood pNHA [001753]	Approximately 8.8km south of the Proposed Scheme	Birch woodland, which is very rare in Co. Dublin.
Howth Head pNHA [000202]	Approximately 10.8km east of the Proposed Scheme	Listed under similar conservation objectives as its SAC and SPA designations. See Table 12.5 under Howth Head SAC and Howth Head Coast SPA
Rogerstown pNHA [000208]	Approximately 11.3km north east of the Proposed Scheme	Listed under similar conservation objectives as its SAC and SPA designations. See Table 12.5 under Rogerstown Estuary SAC and Rogerstown Estuary SPA
Dalkey Coastal Zone and Killiney Hill pNHA [001206]	Approximately 11.2km south east of Proposed Scheme	Good example of a coastal system with habitats ranging from sub-littoral to coastal heath. Flora is well developed and includes some scare species. The islands are important bird sites. Listed under similar conservation objectives as its SAC designations. See Table 12.5 under Rockabill to Dalkey Island SAC and Dalkey Islands SPA

Site Name	Distance	Designation
Glenasmole Valley pNHA [001209]	Approximately 11.5km south west of Proposed Scheme	Listed under similar conservation objectives as its SAC designations. See Table 12.5 under Glenasmole Valley SAC
Lugmore Glen pNHA [001212]	Approximately 12.1km south west of Proposed Scheme	Presence of the rare Red Data Book species Yellow Archangel <i>Lamiastrum galeobdolon</i>
Rye Water Valley/Carton pNHA [001398]	Approximately 12.7km west of Proposed Scheme	Listed under similar conservation objectives as its SAC designation. See Table 12.5 under Rye Water Valley/Carton SAC
Portraine Shore pNHA [001215]	Approximately 12.8km north east of the Proposed Scheme	Listed under similar conservation objectives as its SAC and SPA designations. See Table 12.5 under Rogerstown Estuary SAC and Rogerstown Estuary SPA
Ireland's Eye pNHA [000203]	Approximately 12.9km east of the Proposed Scheme	Listed under similar conservation objectives as its SAC and SPA designations. See Table 12.5 under Ireland's Eye SAC and Ireland's Eye SPA
Dingle Glen pNHA [001207]	Approximately 13.1km south of the Proposed Scheme	Variety of habitat present, including woodland
Ballybetagh Bog pNHA [001202]	Approximately 14.1km south east of the Proposed Scheme	Marshland
Slade of Saggart and Crooksling Glen pNHA [000211]	Approximately 14.5km south west of Proposed Scheme	Wooded river valley and small wetland system. Presence of a rare plant species yellow archangel, a rare invertebrate (<i>Halticoptera patellana</i>) and a variety of wildfowl species.
Loughlinstown Woods pNHA [001211]	Approximately 14.4km south of the Proposed Scheme	Demesne-type mixed woodland
Lambay Island pNHA [000204]	Approximately 18km from the Proposed Scheme	Listed under similar conservation objectives as its SPA designation. See Table 12.5 under Lambay Island SPA
The Murrough pNHA [004186]	Approximately 31km south of the Proposed Scheme	Listed under similar conservation objectives as its SPA designation. See Table 12.5 under The Murrough SPA

12.3.4.3 Other Designated Sites

Other designations recognised in the wider Greater Dublin Area (GDA) including RAMSAR wetlands sites and the Dublin Bay Biosphere which are considered in terms of the overall European and National sites, whilst the three Special Area Amenity Order areas are local to specific BusConnects Core Bus Corridors but are nonetheless captured in the overall EIAR biodiversity assessment and the Natura Impact Statement by virtue of overlapping nature designations, namely European and nationally designated sites.

12.3.4.3.1 RAMSAR Sites

The Convention on Wetlands is an intergovernmental treaty adopted on 2 February 1971 in the Iranian city of Ramsar. The official name of the treaty, 'The Convention on Wetlands of International Importance especially as Waterfowl Habitat' reflects the emphasis on the protection of wetlands primarily as habitat for waterbirds.

There are a number of RAMSAR sites within the vicinity of the Proposed Scheme, namely:

- Rogerstown Estuary (Site code 412);
- Broadmeadow Estuary (Site code 833);
- Baldoyle Bay (Site code 413);
- North Bull Island (Site code 406); and
- Sandymount Strand / Tolka Estuary (Site code 832).

As these RAMSAR sites overlap with European sites and / or NHAs / pNHAs for which this EIAR assessment is considering, no further discussion is provided.

12.3.4.3.2 UNESCO Dublin Bay Biosphere

Dublin Bay was initially recognised by the United Nations Education, Scientific and Cultural Organisation (UNESCO) for its rare and Internationally Important habitats and species of wildlife. North Bull Island supports a variety of plants and wildlife including an internationally significant population of light bellied Brent goose that overwinters in the bay. UNESCO's concept of a Biosphere has evolved to include not just areas of ecological value but also the areas around them and the communities that live and work within these areas. The Dublin Bay Biosphere now extends to over 300km² of marine and terrestrial habitat encompassing North Bull Island and ecologically significant habitats such as the Tolka and Baldoyle Estuaries, Howth Head, Dalkey Island, Killiney Hill and Booterstown Marsh. Over 300,000 people live within the newly enlarged Biosphere Reserve.

While the Biosphere designation does not strictly add any specific new legal protection, it greatly enhances the many legal protections that already exist by improving the co-ordination and management of the three functions in a holistic and integrated way. In this respect the biodiversity assessment for the EIAR and the AA for the Proposed Scheme collectively addresses the key biodiversity elements of the Biosphere designation, and no further discussion is provided in this regard.

12.3.4.3.3 Special Amenity Area Order

The objective of the Special Amenity Area Order is primarily to protect outstanding landscapes, nature and amenities and were originally placed on a statutory footing under Number 28 of 1963 - Local Government (Planning and Development) Act, 1963, as amended, and re-enacted under section 202 of Number 30 of 2000 – Planning and Development Act, 2000, as amended.

Three such Special Amenity Area Orders have been recognised in Ireland, all of which are located within the GDA. None will be directly intersected by the Proposed Scheme. They include:

- Liffey Valley;
- North Bull Island; and
- Howth Head.

The Special Amenity Area Order designation re-enforces the protection of green belts via land plans and objectives contained therein. As such, these areas have been considered in the overall EIAR biodiversity assessment and AA, respectively, by virtue of overlapping nature designations.

12.3.5 Habitats

12.3.5.1 Overview

The results of the habitat surveys along the alignment of the Proposed Scheme are described below by habitat type (Fossitt 2000), with the exception of habitats classified as residential. These constitute areas of residential

properties and gardens. The habitats described below relate to habitat areas within or adjacent to the Proposed Scheme, as shown on Figure 12.5 in Volume 3 of this EIAR along with the full habitat survey results. The results and summary of the findings of the aquatic habitat surveys have been incorporated into the relevant habitat descriptions.

The habitat types recorded along the footprint of the Proposed Scheme, as discussed in this Section, are as follows:

- Flower beds and borders (BC4);
- Buildings and artificial surfaces (BL3);
- Tidal rivers (CW2);
- Exposed sand, gravel, or till (ED1)
- Spoil and bare ground (ED2);
- Recolonising bare ground (ED3);
- Refuse and other waste (ED5);
- Other artificial lakes and ponds (FL8);
- Reed and large sedge swamps (FS1);
- Depositing/ lowland rivers (FW2);
- Canals (FW3);
- Drainage ditches (FW4);
- Amenity Grassland (Improved) (GA2);
- Dry meadows & grassy verges (GS2);
- Residential;
- (Mixed) broadleaved woodland (WD1);
- Scattered trees and parkland (WD5);
- Hedgerows (WL1);
- Treelines (WL2);
- Scrub (WS1); and
- Ornamental/ non-native shrub (WS3).

With the exception of the Liffey Estuary Upper, which is alongside the terminus of the Proposed Scheme at R148 Arran Quay and is classified as Tidal River (CW2), corresponding to the Annex I habitat Estuaries [1130] designation, none of the remaining habitats within the Proposed Scheme correspond to Annex I habitats or QI habitats.

12.3.5.2 Flower beds and borders (BC4)

This habitat type was identified in eight locations across the Proposed Scheme largely associated with commercial landscaping. The largest areas of this habitat type are located at Glasnevin Hill along the perimeter of the National Botanical Gardens and at Lisburn Street apartment blocks with beds planted with a wildflower mix of yarrow *Achillea millefolium*, chicory *Cichorium intybus*, vetch species *Vicia* sp., marigold species *Tagetes* sp., fennel *Foeniculum vulgare*, Geranium species *Geranium* sp., mustard *Brassica rapa*, borage *Borago officinalis*, spear thistle *Cirsium vulgare* and clover species *Trifolium* sp.

Smaller areas of this habitat type are present at the junction of R132 Church Street and R804 Brunswick Street North, on R108 Constitution Hill at Temple Cottages, on R108 Ballymun Road at Our Lady of Victories Church, and the road median at the R108 Botanic Road / Lindsay Road Junction. Species identified at these locations included various ornamental bedding plants, cotoneaster species *Cotoneaster* sp., fuchsia species *Fuchsia* sp., New Zealand broadleaf *Griselinia littoralis*, Hydrangea species *Hydrangea* sp. and Rose species *Rosa* sp.

The roadside median on R132 Church Street at Linenhall Terrace is planted with a range of ornamental species including non-native African lily *Agapanthus africanus*, snowdrop anemone *Anemonoides sylvestris*, palm tree species *Areaceae* sp., Indian shot *Canna indica*, montbretia *Crocasmia x crocosmiiflora*, delphinium, red-hot poker *Kniphofia*, ornamental grass, black eyed Susan *Rudbeckia hirta*, baby sage *Salvia microphylla* and corn *Zea mays*.

Native species recorded in this habitat type include bittercress species *Cardamine* sp., foxglove species *Digitalis* sp., spurge species *Euphorbia* sp., *Iris* sp., red dead-nettle *Lamium purpureum*, cowslip *Primula veris*, common primrose *P. vulgaris*, curled dock *Rumex crispus* and common chickweed *Stellaria media*.

This habitat type was also found in mosaics with the following habitats: amenity grassland (improved) (GA2) and buildings and artificial surfaces (BL3) and ornamental / non-native shrub (WS3).

This habitat type is of Local Importance (Lower Value) due to its fragmented nature and as it is typically characterised by a large number of non-native species.

12.3.5.3 Buildings and artificial surfaces (BL3)

This habitat type includes all buildings (i.e. domestic, commercial and industrial), roads, car parks, artificial recreation surfaces and other concrete / hardstanding areas. This habitat type was the most commonly encountered habitat and was present across the entire length of the Proposed Scheme, owing to the largely urban and suburban nature of the study area.

This habitat type was also found in association with the following habitats: flower beds and borders (BC4), ornamental/non-native shrub (WS3), amenity grassland (GA2), recolonising bare ground (ED3), hedgerows (WL1), treelines (WL2) and scrub (WS1).

This habitat type is of Local Importance (Lower Value) due to being a built / artificial surface and paucity of vegetation.

12.3.5.4 Tidal rivers (CW2)

This habitat type consisted entirely of the Liffey Estuary Upper, located at the proposed terminus of the Proposed Scheme at R148 Arran Quay. This section of the River Liffey is approximately 40m to 45m wide and has an average depth of approximately 4m to 5m with high retaining quay walls either side of the channel.

The Liffey Estuary Upper is a transitional water body and is within the Liffey Nutrient Sensitive Area. It is fed by the Camac_040, Liffey_190 and Poddle_010 and flows into Liffey Estuary Lower before reaching Dublin Bay. The Liffey Estuary Upper is within 15m of the Proposed Scheme at the Father Mathew Bridge.

The Liffey Estuary Upper is classified as 'Good' status for the period 2013 to 2018 and is not deemed at risk of failing to meet its requirements under the WFD. However, it is classified as 'At Risk' of not achieving the WFD objective of Good Status by 2027, which means a deterioration in status is anticipated. The main risk is urban wastewater from combined sewer overflows (CSOs) at Ringsend. The key impacts are considered to be nutrient pollution and alterations to habitats due to morphological changes. In terms of assigning sensitivity, the Good Status of the Liffey Estuary Upper means that it would be of High sensitivity. Its direct connection to Dublin Bay SAC is also considered and this raises the sensitivity to Very High.

The Liffey Estuary Lower is classified as 'Good' status for the period 2013 to 2018 and is not deemed 'At Risk' of failing to meet its requirements under the WFD. The Liffey Estuary Lower corresponds to the Annex I habitat Estuaries [1130] and its location overlaps with the current favourable reference range and distribution of this Annex I habitat (NPWS 2019b). The current trend for this habitat at a national scale is assessed as being 'stable', with both its range and area in a 'favourable' condition. Future prospects for the habitat are deemed as 'inadequate' based on its 'poor' structure and functions. Therefore, its overall conservation status is deemed as 'inadequate' (NPWS 2019b).

This habitat type corresponds with the Annex I habitat Estuaries [1130] and is of National Importance.

12.3.5.5 Exposed sand, gravel or till (ED1)

This habitat type was assigned to habitats which consisted of till or boulder clay. An area of exposed sand, gravel or till was identified on the Royal Canal Way, to the rear of Des Kelly Interiors at Cross Guns Bridge. This habitat consists of spoil heaps containing railway ballast and rubble. Within this habitat are mosaics of recolonising bare ground.

This habitat type is of Local Importance (Lower Value) due to its low species diversity and disturbed nature.

12.3.5.6 Spoil and bare ground (ED2)

This habitat type was present throughout the Proposed Scheme in small areas of bare ground, often associated with access ways, such as gravel driveways. Areas of bare ground, which have recently been sown with grass but are not yet adequately vegetated were also classified as being spoil and bare ground habitat.

Plant species recorded within this habitat include butterfly-bush *Buddleia davidii*, ivy-leaved toadflax *Cymbalaria muralis*, perennial rye-grass *Lolium perenne* and common groundsel *Senecio vulgaris*.

This habitat type was also found in mosaics with recolonising bare ground (ED3) and scrub (WS1) habitats.

This habitat type is of Local Importance (Lower Value) due to its low species diversity and disturbed nature.

12.3.5.7 Recolonising bare ground (ED3)

This habitat type was assigned to areas of disturbed ground and / or artificial surfaces which have been recolonised by plants, and vegetation cover is now greater than 50%. This habitat type was identified in five locations across the footprint of the Proposed Scheme, the largest of these areas included a 0.14ha (hectare) area at Domville Woods bordering R104 Santry Avenue, and a construction site east of R108 Botanic Road. Additional pockets of this habitat were identified at the rear of Circle K at Northwood Avenue, adjacent to the Cross Guns Bridge crossing point at the Royal Canal, and at R108 Phibsborough Road at Monck Place.

Most of the vegetation recorded were ruderal species commonly found in this habitat type. Typical species recorded included creeping thistle *Cirsium arvense*, common ragwort *Jacobaea vulgaris*, rosebay willowherb *Chamaenerion angustifolium*, bramble *Rubus fruticosus* agg., winter heliotrope *Petasites pyrenaicus*, common nettle *Urtica dioica*, butterfly-bush, fescue species *Festuca* sp., willowherb species *Epilobium* sp., yellow-wort *Blackstonia perfoliata*, Canadian fleabane *Erigeron canadensis* and broad-leaved dock *Rumex obtusifolius*.

This habitat type also occurred in mosaics with buildings and artificial surfaces (BL3), spoil and bare ground (ED2) and scrub (WS1) habitat types.

This habitat type is of Local Importance (Lower Value) due to the disturbed nature of this habitat type.

12.3.5.8 Refuse and other waste (ED5)

This habitat type is present in areas where domestic, industrial, agricultural, and other waste is stored, treated, or disposed. This was identified at one location adjacent to Premier Square on R135 Finglas Road.

This habitat type is of Negligible Importance.

12.3.5.9 Other artificial lakes and ponds (FL8)

An artificial pond is present within in Blessington Street Park, approximately 30m east of the Proposed Scheme. There are concrete containing walls, and as such, no riparian vegetation is present. Adjacent habitats include flower beds and borders (BC4) present at pond edges and an island with ornamental / non-native shrub within the pond.

This habitat type is of Local Importance (Lower Value) although it is not common in the surrounding area, it is highly anthropogenically influenced with no riparian vegetation and low species diversity.

12.3.5.10 Reed and large sedge swamps (FS1)

This habitat type is located in wetland areas and is comprised of species-poor herbaceous vegetation stands that are dominated by reeds and other large grasses or large, tussock-forming sedges. This was identified in one location across the footprint of the Proposed Scheme, along the Royal Canal Bank at Cross Guns Bridge. The

dominant species include reed canary-grass *Phalaris arundinacea*, common reed *Phragmites australis* and flag iris *pseudacorus*.

This habitat type is of National Importance, and although it is not common within the footprint of the Proposed Scheme, it is a constituent part of the Canal habitat mosaic (See Section 12.3.5.12 - Canals), which is designated as a pNHA.

12.3.5.11 Depositing / lowland rivers (FW2)

This habitat type refers to the River Tolka, Claremont Stream, and Bachelors Stream which are classified as depositing / lowland rivers. These habitats are present at multiple locations across the Proposed Scheme and are discussed individually below. The River Tolka is classified as 'Poor' status for the period 2013 to 2018 and is deemed 'At Risk' of failing to meet its requirements under the WFD. The Proposed Scheme will cross the River Tolka at three locations on R135 Finglas Road, Glasnevin Hill, and R108 St. Mobhi Road (illustrated in Figure 12.2 in Volume 3 of this EIAR). The River Tolka is culverted under these existing roads. The EPA segments of the River Tolka which are contained within the study area are Tolka_050 and Tolka_060. The Tolka_050 segment is approximately 9.25km long and consists of the main channel of the River Tolka from Blanchardstown to Glasnevin, as well as three minor unnamed tributaries in Finglas. The Tolka_060 segment is approximately 3km long and flows from Glasnevin to Drumcondra, then directly into the Tolka Estuary after approximately 1.5km from where it will cross the Proposed Scheme. For both segments, the catchment contributions are considered to be primarily urban.

The Tolka_050 will run parallel to the Proposed Scheme for approximately 1.8km until the main branch of the Tolka_050 will be crossed by the Proposed Scheme just north of Ballyboggan Road, south of Baleskin. The Tolka_050 has Poor WFD status and is 'At Risk' of achieving Good status by 2027. Its main pressures include urban runoff and urban wastewater from CSOs.

Tolka_060 will be crossed by the Proposed Scheme at Dean Swift Bridge on R108 St. Mobhi Road, north-west of Drumcondra. The Tolka_060 flows into the Tolka Estuary which is a Nutrient Sensitive Area. It then flows into the North Bull Island transitional water body at Raheny. North Bull Island is a SPA and Santry_020 is also hydrologically connected to the Tolka Estuary which is a Nutrient Sensitive Area. The ecological status of the Tolka_060 segment is unassigned but is however At Risk of not achieving Good Status by 2027. Its main pressures are due to urban runoff and urban wastewater from CSOs.

The most recent Biological Q Value assessment of the River Tolka was in 2019. Five stations were monitored along the length of the water body, one of which (RS09T011100) is located within the study area, approximately 0.3km downstream of the Ballymun Section of the Proposed Scheme. This station gave a Q Value of Q3, which equates to poor water quality.

Riparian vegetation identified along the River Tolka banks include sycamore *Acer pseudoplatanus*, false oat-grass *Arrhenatherum elatius*, butterfly bush *Buddleia davidii*, hedge bindweed *Calystegia sepium*, globular thistle *Echinops* sp., hoary willowherb *Epilobium parviflorum*, wallflower species *Erysimum* sp., ash *Fraxinus excelsior*, perennial ryegrass, bramble, broad-leaved dock, willow species *Salix* sp., and common nettle and the third non-native invasive species Himalayan balsam *Impatiens glandulifera*.

The Proposed Scheme will cross the Claremont Stream at St Mobhi Drive (illustrated in Figure 12.2 in Volume 3 of this EIAR). The Claremont Stream is a small underground stream culverted beneath St. Mobhi Drive and discharges to the River Tolka. The Claremont Stream is contained under the River Tolka WFD classification as 'Poor' status for the period 2013 to 2018 and is deemed 'At Risk' of failing to meet its requirements under the WFD.

The Proposed Scheme will run adjacent to Bachelors Stream along the R135 Finglas Road (illustrated in Figure 12.2 in Volume 3 of this EIAR). Bachelors Stream is largely underground, culverted beneath R135 Finglas Road and is a tributary of the River Tolka. Bachelors Stream is contained under the River Tolka WFD classification as 'Poor' status for the period 2013 to 2018 and is deemed 'At Risk' of failing to meet its requirements under the WFD.

This habitat type is of Local Importance (Higher Value) as it is not common in the surrounding area.

12.3.5.12 Canals (FW3)

The Royal Canal Main Line (Liffey and Dublin Bay) is an Artificial Water Body (AWB), primarily used for recreation. Constructed in the 18th century, shortly after the Grand Canal, the Royal Canal is 145km long and runs from the River Liffey in Dublin to Cloondara on the River Shannon, with an 8km branch line into the town of Longford. The Proposed Scheme will traverse the Royal Canal at Cross Guns Bridge on R108 Prospect Road, north of Phibsborough. Canals are AWBs and consequently are classified based on their ecological potential rather than ecological status. Assessment of the canals using macroinvertebrates indicates generally good biological conditions. Similarly, positive results were identified in terms of macrophyte assessment. The Royal Canal achieved good ecological potential in the period from 2013 to 2015 (EPA 2018).

The WFD also considers heavily modified water bodies (HMWBs) and AWBs and requires them to achieve good ecological potential rather than Good Status. The Royal Canal has good ecological potential. Inland Fisheries Ireland (IFI) states in its consultation response that the Royal Canal supports significant populations of coarse fish and a range of other freshwater aquatic species, plus all associated floral and faunal components in adjacent habitats (IFI 2020).

In terms of assigning sensitivity, the Good Status of the Royal Canal means that it would be of High sensitivity. Its connection with the Liffey Estuary Lower and ultimate hydrological connection to Dublin Bay is also considered, however even without a direct connection to Dublin Bay, sensitivity would still remain as High.

Species recorded along the Royal Canal banks include pendulous sedge *Juncus pendula*, reed canary grass, whorl-leaf watermilfoil *Myriophyllum verticillatum*, greater water-moss *Fontinalis antipyretica*, ivy-leaved duckweed *Lemna trisulca*, yarrow, cow parsley *Anthriscus sylvestris*, false oat-grass, butterfly bush, shepherd's purse *Capsella bursa-pastoris*, common knapweed *Centaurea nigra*, field bindweed *Convolvulus arvensis*, wild carrot *Daucus carota*, wild teasel *Dipsacus fullonum*, hoary willowherb, red fescue *Festuca rubra*, common hogweed *Heracleum sphondylium*, Yorkshire-fog *Holcus lanatus*, flag iris, common nipplewort *Lapsana communis*, oxeye daisy *Leucanthemum vulgare*, black medick *Medicago lupulina*, redshank *Persicaria maculosa*, common reed, broadleaf plantain *Plantago major*, annual meadow grass *Poa annua*, common fleabane *Pulicaria dysenterica*, common ragwort, dandelion *Taraxacum officinale* agg., clover species, colt's-foot *Tussilago farfara* and common nettle.

The Royal Canal is designated as a pNHA. This habitat type is therefore valued as being of National Importance. In addition to the floral assemblage noted for this habitat, other habitats (See Section 12.3.5.10 Reed and Large Sedge Swamps FS1) can occur as part of the fragmented mosaic that characterises the canal.

12.3.5.13 Drainage ditches (FW4)

Drainage ditches habitat was identified at one location within the footprint of the Proposed Scheme. This was identified within the grounds of Santry Lodge, east of St. Margaret's Road. The drainage ditch contained stagnant water with high discoloration and was 1m wide, with a shallow water depth.

The drainage ditch was highly shaded by bramble, sycamore and hedge bindweed *Calystegia sepium* and contained a significant amount of waste.

Riparian vegetation included scrub habitat with mosaics of dry meadow and grassy verges (GS2) contained within.

This habitat type is of Local Importance (Lower Value) by virtue of its extent, condition and paucity of flora.

12.3.5.14 Amenity Grassland (Improved) (GA2)

Amenity grassland was a commonly recorded habitat across the Proposed Scheme. It is present in small areas located across the entirety of the Proposed Scheme. The largest areas of this habitat were recorded in public parks and sports pitches including Mellowes Park, Naul Park, and Home Farm football pitch on R108 St. Mobhi Road. It was also recorded along the River Tolka and as part of road landscaping of verges and medians.

This habitat is comprised of a range of common grass species including cocks-foot *Dactylis glomerata*, wall barley *Hordeum murinum*, perennial ryegrass and forb species including yarrow, silverweed *Argentina anserina*, daisy

Bellis perennis, common knapweed, hawksbeard *Crepis* sp., mayweed species *Matricaria* sp., ribwort plantain *Plantago lanceolata*, broadleaf plantain, London plane *Platanus × acerifolia*, annual meadow grass, creeping cinquefoil *Potentilla reptans*, creeping buttercup *Ranunculus repens*, red clover *Trifolium pratense* and white clover *Trifolium repens*.

This habitat type often occurred in mosaics with buildings and artificial surfaces (BL3), flower beds and borders (BC4), ornamental / non-native shrub (WS3), hedgerows (WL1), treelines (WL2), dry meadows and grassy verges (GS2) and mixed broadleaved woodland (WD1).

This habitat type is of Local Importance (Lower Value) due to low species diversity.

12.3.5.15 Dry meadows and grassy verges (GS2)

This habitat type is comprised of unmanaged grassland areas including areas of parkland following a low maintenance regime and roadside verges. This habitat type was recorded in 10 areas of varying sizes located across the Proposed Scheme. Prominent areas of this habitat were identified in large green spaces to the north and south of St. Margaret's Road at its junction with the R108 Ballymun. Smaller areas were observed at R104 Balbutcher Lane / Shangan Road in Ballymun, along the R135 Finglas Road north of Ballyboggan Road and south of Clearwater Shopping Centre, grassy verges along the banks of the Royal Canal, a site between the Luas track and Hammond Lane off R132 Church Street, and on R108 Botanic Road at the Sunnybank Hotel.

Grass species recorded included creeping bent-grass *Agrostis stolonifera*, cocks-foot, Yorkshire-fog, perennial ryegrass, false oatgrass, annual meadow grass and red fescue. Forb species include Canadian fleabane, ivy-leaved toadflax, mugwort *Artemisia vulgaris*, meadow sweet *Filipendula ulmaria*, red valerian *Centranthus ruber*, common nettle, dog-rose *Rosa canina*, great willowherb *Epilobium hirsutum*, smooth sowthistle *Sonchus oleraceus*, amphibious bistort *Persicaria amphibia*, creeping buttercup, silverweed *Potentilla anserina*, yarrow, hedge bindweed, sycamore, common hogweed, cherry blossom *Prunus serrulate*, rosebay willowherb, hoary willowherb, daisy, common knapweed, creeping thistle, common ragwort, dandelion, red clover, wild teasel, birdsfoot trefoil *Lotus corniculatus*, ribwort plantain, cleavers *Galium aparine*, crane's-bill *Geranium*, white clover, creeping cinquefoil, bramble, broad-leaved dock, butterfly bush, dogwood *Cornus* sp., hawksbeard, willow species, tufted vetch *Vicia cracca*, bush vetch *V. sepium* and rush species *Juncus* sp.

This habitat type also occurred in mosaics with scrub (WS1), amenity grassland (GA2) and treelines (WL2).

Notwithstanding the reduced distribution and relative diversity of flora of this unmanaged habitat type across the footprint of the Proposed Scheme, this habitat type is of Local Importance (Lower Value) since many of the character species that define the habitat as per Fossitt (2000) are absent, the remaining flora being widely distributed across a range of habitats and reflecting the relative extent and presence of species from other adjacent habitats.

12.3.5.16 Residential

This non-Fossitt classification is used to represent residential properties along the Proposed Scheme corridor and generally consists of a mosaic of buildings and artificial surfaces (BL3), amenity grassland (GA2), flower beds and borders (BC4), ornamental shrubs (WS3) and hedgerows (WL1).

This habitat type was commonly encountered and was present across the entirety of the Proposed Scheme corridor.

This habitat type is of Local Importance (Lower Value) due to low species diversity.

12.3.5.17 (Mixed) broadleaved woodland (WD1)

This habitat was located at four areas across the footprint of the Proposed Scheme. The largest areas of this habitat type were identified bordering R135 Finglas Road, south of its junction with R102 Tolka Valley Road. Additional areas of this habitat type were recorded at Hampstead Avenue and linear segments bordering R135 Finglas Road.

Tree species recorded at these locations included sycamore, birch species *Betula* sp., ash, willow species, elder *Sambucus nigra*, beech *Fagus sylvatica*, copper beech *F. sylvatica* f. *purpurea*, cherry species *Prunus* sp., rowan *Sorbus aucuparia*, poplar species *Populus* sp., red maple *A. rubrum*, and larch species *Larix* sp.

Where present, understories and ground flora species include common ivy *Hedera helix*, bramble, variegated holly *Ilex aquifolium*, sweetshrub *Calycanthus* sp., bush vetch *Vicia sepium*, snowberry *Symphoricarpos albus* and marigold species, butterfly bush and cherry laurel *Prunus laurocerasus* were occasionally present. This habitat type also occurred as a mosaic with amenity grassland (GA2).

This habitat type is of Local Importance (Higher Value) as it is not common in the surrounding area and is relatively species-rich in the context of surrounding habitats.

12.3.5.18 Scattered trees and parkland (WD5)

This habitat classification describes areas of scattered trees, standing alone or in small clusters, which are a prominent structural or visual feature of the habitat. This habitat type was widespread across the Proposed Scheme. The most significant areas of this habitat type were present at Glasnevin Cemetery grounds, Albert College Park and the Royal Canal Bank from R101 North Circular Road to Primrose Avenue.

Tree species identified at these locations include maple species *Acer* sp., Norway maple *A. platanoides*, sycamore, red maple, horse chestnut *Aesculus hippocastanum*, alder *Alnus glutinosa*, birch, downy birch *Betula pubescens*, hornbeam *Carpinus Fastigiata* Lucas, sweet chestnut *Castanea sativa*, cypress species *Cupressus* sp., beech, ash, larch species, pines *Pinus* sp., Scots pine *P. sylvestris*, London plane, American sycamore *P. occidentalis*, poplar species, Japanese bush cherry *Prunus japonica*, oak species *Quercus* sp., holm oak *Q. ilex*, willow species, elder, whitebeam *Sorbus aria*, rowan, yew *Taxus baccata*, small-leaved lime *Tilia cordata* and American sweetgum *Liquidambar styraciflua*.

The understory was commonly comprised of common ivy and forb species including yarrow, yellow aster *Asteraceae* sp., creeping buttercup, bramble, curled dock, common dandelion, white clover and common nettle. Grasses present include cocks-foot, Yorkshire-fog, perennial ryegrass, annual meadow grass and fern-grass *Catapodium* sp. Some locations had ornamental New Zealand broadleaf hedging.

This habitat type also occurred in mosaics with treeline (WL2) habitat.

This habitat type is of Local Importance (Higher Value) as it is not common in the surrounding area and is relatively species-rich in the context of surrounding habitats.

12.3.5.19 Hedgerows (WL1)

Hedgerows were widespread across the Proposed Scheme. These consisted of linear strips of shrubby vegetation, often containing trees, which frequently demarcated property / field boundaries. The majority of hedgerows recorded along the Proposed Scheme consisted of screening vegetation at residential properties, along roadsides and within the vegetated median of larger roads. Substantial areas of this habitat are present at Mellows Park and along the centre road medians on the 135 Finglas Road and R108 Ballymun Road. There is also a small area of this habitat at the Met Eireann office at Glasnevin Hill.

The species composition varied greatly within this habitat type. Tree and shrub species consist of maple species, field maple, horse chestnut, alder, grey alder *A. incana*, hawthorn *Crataegus monogyna*, cypress species, *Cupressus* × *leylandii*, hornbeam, beech, copper beech, ash, larch species, bay laurel *Laurus nobilis*, sycamore, poplar species, cherry laurel, blackthorn *Prunus spinosa*, rose species, bramble, willow species, goat willow *Salix caprea*, grey willow *S. cinerea*, elder, yew, small-leaved lime, birch, butterfly bush, conifer species cabbage-palm *cordylina*, dogwood, hazel *Corylus avellana*, cotoneaster, fuchsia species, New Zealand broadleaf, St. John's wort species *Hypericum* sp., holly *Ilex aquifolium*, garden privet *Ligustrum ovalifolium* and pine species.

Ground flora and forb species consist of yarrow, daisy, barren-brome grass *Bromus sterilis*, common knapweed, spear thistle, traveller's-joy *Clematis vitalba*, field bindweed, hawksbeard, rosebay willowherb, cleavers, common ivy, common hogweed, Yorkshire-fog, ribwort plantain, common groundsel, alexanders *Smyrniium olusatrum*,

bittersweet nightshade *Solanum dulcamara*, snowberry, common nettle, common valerian *Valeriana officinalis* and culver's root *Veronicastrum virginicum*.

This habitat type also occurred in mosaics with amenity grassland (GA2), scrub (WS1), treeline (WL2) and buildings and artificial surfaces (BL3) habitat types.

This habitat type is of Local Importance (Higher Value) as it is not common in the surrounding area and is relatively species-rich in the context of surrounding habitats.

12.3.5.20 Treelines (WL2)

This habitat is comprised of narrow rows or single lines of trees which are greater than 5m in height. This habitat type was recorded extensively across the Proposed Scheme.

A number of roads including R108 Ballymun Road, R108 St. Mobhi Road, Old Finglas Road, and St. Mobhi Drive are lined with trees. In the context of the Proposed Scheme, treeline habitat is typically urban street planting along footpaths / strips of amenity grassland and road edges. This habitat type was also present within landscaped areas of residential, commercial, industrial, complexes and estates. A number of treelines were located within parks and public areas such as Albert College Park, Na Fianna GAA and Home Farm sports pitches.

Species frequently recorded include London plane, small-leaved lime, sycamore, maple species, horse chestnut, hazel, hawthorn, birch, butterfly bush, cypress species, alder, silver birch *Betula pendula*, hornbeam, beech, ash, poplar species, blackthorn, oak species, Japanese cherry, cherry, cherry laurel, rowan, yew, field maple, firs *Pinaceae* sp., larch species, pitch pine *Pinus rigida*, willow species, elder, Scots pine, purple maple *Acer palmatum* (*Atropurpureum*), downy birch, sweet chestnut and Monterey cypress *Hesperocyparis macrocarpa*.

The understory consists of a variety of species including common ivy, common knapweed, cocks-foot, wall barley, traveller's-joy, dogwood, hawksbeard, holly, perennial ryegrass, broadleaf plantain, bramble and white clover.

This habitat type also occurred in mosaics with dry meadows and grassy verges (GS2), amenity grassland (GA2), buildings and artificial surfaces (BL3), hedgerows (WL1) and ornamental / non-native shrub (WS3).

This habitat type is of Local Importance (Higher Value) as it is not common in the surrounding area and is relatively species-rich in the context of surrounding habitats.

12.3.5.21 Scrub (WS1)

Several patches of scrub were identified along the Proposed Scheme corridor, the largest of which is located within the grounds of Santry Lodge, south of the drainage ditch. There are large areas of this habitat along the road medians. There are two areas at Albert Park Crescent on the R108 Ballymun Road, a strip which runs along the River Tolka at St. Mobhi Drive and two sections along the railway lines north of Whitworth Road at Cross Guns Bridge. Further locations with this habitat are found along the R135 Finglas Road from Lidl at Glasnevin Cemetery to Hazel Apartments and the land found north and south of the River Tolka at Ballyboggan Road. There are some small areas at Glasnevin Downs.

Species recorded consisted of cow parsley, butterfly bush, spear thistle, traveller's-joy, field bindweed, cotoneaster, hawksbeard, rosebay willowherb, hoary willowherb, ash, common ivy, St. John's wort species, redshank, winter heliotrope, ribwort plantain, annual meadow grass, bramble, broad-leaved dock, rosemary *Salvia rosmarinus*, elder, bittersweet nightshade and colts-foot.

This habitat type also occurred in mosaics with hedgerow (WL1), buildings and artificial surfaces (BL3), spoil and bare ground (ED2) and recolonising bare ground (ED3).

This habitat type is of Local Importance (Lower Value) due to low species diversity.

12.3.5.22 Ornamental / non-native shrub (WS3)

Areas of ornamental / non-native shrub were generally associated with amenity and landscape planting at commercial properties. Substantial areas of this habitat type bordered areas of amenity grassland habitat at Our Lady of Victories Church on R108 Ballymun Road, Albert College Lawn and at Our Lady of Dolours Church on Botanic Avenue. Locations of this habitat in association with buildings and artificial surfaces habitat were identified at Dublin City University (DCU) Innovation Campus on the Old Finglas Road, the Bons Secours Hospital on Glasnevin Hill, Addison Lodge, the junction of the Old Finglas Road and the R135 Finglas Road, and around Care Choice Nursing Home on R135 Finglas Road. It was also identified at the junction of Main Street / North Street Finglas on a roadside median in mosaic with scrub (WS1).

Species identified in these areas include maple species, bamboo species birch species, chicory, smoke tree *Cotinus* sp., cotoneaster species, eucalyptus *Eucalyptus gunnii*, ash, fuchsia species., hydrangea species, St. John's wort species, holly, lavender species *Lavandula* sp., garden privet, lily species *Lilium* sp., geranium *Pelargonium*, red robin *Photinia x fraseri*, cherry laurel, snowberry and assorted planters containing bedding and shrubs.

This habitat type was recorded in mosaics with amenity grassland (GA2), treelines (WL2) and buildings and artificial surfaces (BL3).

This habitat type is of Local Importance (Lower Value) due to high cover of non-native species.

12.3.6 Rare and Protected Plant Species

No protected plant species listed on the Flora Protection Order (FPO) were identified within the footprint of the Proposed Scheme during field surveys.

The desk study returned records of a total of five species listed on the FPO across the wider study area (i.e. Grid Squares O13 and O14) and are listed in Appendix A12.1 in Volume 4 of this EIAR. Records within close proximity to the Proposed Scheme include two historical records of opposite-leaved pondweed *Groenlandia densa*, with one located at Glasnevin Cemetery (i.e. record from 1999, located within Grid Square O13N) and the remaining record located south of the River Liffey at Cork Street (Grid Square O13L) (NBDC 2020). This species is 'Near Threatened' on Ireland's Red List No. 10: Vascular Plants 2016 (Wyse Jackson *et al.*, 2016) and is known to occur throughout the Royal Canal.

One plant species listed as 'Critically Endangered' within Ireland's Red List No. 10: Vascular Plants (Wyse Jackson *et al.* 2016) was returned from the desk study; a historical record of the vascular plant Water-violet *Hottonia palustris* located at Glasnevin Cemetery (i.e. record from 1999, located within Grid Square O13N).

Two plant species listed as 'Vulnerable' were returned from Ireland's Red List No. 8: Bryophytes (Lockhart *et al.* 2012). Dittander *Lepidium latifolium* at the Royal Canal and the shady beard-moss *Didymodo numerosus* at the National Botanic Gardens, Glasnevin (NBDC 2020).

Results returned from a NPWS data search included records of one species listed on the FPO at Santry Demesne, within 1km of the Proposed Scheme (NPWS Consultation 2021b); hairy St. John's-wort *Hypericum hirsutum*. This species is also listed as 'Vulnerable' on Ireland's Red List No. 10: Vascular Plants 2016 (Wyse Jackson *et al.* 2016).

No rare or threatened macrophytes were recorded by Triturus Environmental Ltd (2020) during the aquatic surveys undertaken along the River Tolka and the Royal Canal, although it was considered likely that the FPO opposite-leaved pondweed (*Groenlandia densa*) had the potential to occur in the Royal Canal in the areas of the Proposed Scheme by virtue of the water depth and its documented occurrence up, and downstream (Triturus Environmental Ltd. 2020). The desk study for the aquatic survey also noted an historical record of the red-listed Alga tassel stonewort (*Tolypella intricata*), although based on habitat preferences and water depth, this section of the Royal Canal was considered unsuitable to support it.

12.3.7 Non-Native Invasive Plant Species

There were five areas of non-native invasive plant species listed on the Third Schedule of the Birds and Habitats Regulations identified along the Proposed Scheme. The locations of these non-native invasive plant species are summarised below in Table 12.7 and shown on Figure 12.6 in Volume 3 of this EIAR.

The desk study returned records of a total of four species listed on the Third Schedule of the Birds and Habitats Regulations, and one delisted species, across the wider study area (i.e. Grid Squares O13 and O14) and are listed in Appendix A12.1 in Volume 4 of this EIAR. Records within close proximity to the Proposed Scheme include giant hogweed *Heracleum mantegazzianum*, Japanese knotweed *Reynoutria japonica* and Himalayan balsam *Impatiens glandulifera* scattered along the banks of the River Tolka across the Proposed Scheme.

An aquatic survey conducted in October 2020 along the Royal Canal between the 4th and 5th lock (level 4, Phibsborough) in respect of the Proposed Scheme, recorded Nuttall's waterweed *Elodea nuttallii* and the recently de-listed Canadian waterweed *Elodea canadensis*, which were noted as being frequent (Triturus Environmental Ltd. 2020).

Several records of Brazilian giant-rhubarb *Gunnera manicata*, New Zealand pigmyweed *Crassula helmsii*, three-cornered garlic *Allium triquetrum*, Nuttall's waterweed (Species of Union Concern) *Elodea nuttallii*, and water fern *Azolla filiculoides* were recorded within the grounds of the National Botanic Gardens adjacent to the Proposed Scheme (NBDC 2020). These species were not present within the footprint of the Proposed Scheme.

Table 12.7: Summary of Non-Native Invasive Plant Species Listed in the Third Schedule of the Birds and Habitats Regulations Recorded Along or Adjacent to the Proposed Scheme

Reference	Species	Description
CBC0304IAPS001	Giant hogweed <i>Heracleum mantegazzianum</i>	Stand in inaccessible woodland
CBC0304IAPS002	Himalayan balsam <i>Impatiens glandulifera</i>	Scattered along the banks of the River Tolka
CBC0304IAPS003	Japanese knotweed <i>Reynoutria japonica</i>	Small stand within planted hedgerow
CBC0304IAPS004	Japanese knotweed <i>Reynoutria japonica</i>	Small stand on roadside - treated
CBC0304IAPS005	Nuttall's waterweed <i>Elodea nuttallii</i> (and Canadian waterweed <i>Elodea canadensis</i> (no longer a third schedule species))	In the Royal Canal

12.3.8 Mammals

12.3.8.1 Bats

Bats, including their breeding and resting places, are protected under the Wildlife Acts. All bat species are also listed on Annex IV of the Habitats Directive; with the lesser horseshoe bat also listed on Annex II. Bats are also afforded strict protection under the Habitats Directive and the Birds and Habitats Regulations.

Bat surveys were carried out across three seasons; spring, summer and autumn (as described in Section 12.2.3.5) in the preparation of this EIAR. Surveys were conducted in June to August 2018, September and October 2019, May 2020, July 2020 and in July 2021. There were four transects where bat surveys were undertaken across the footprint of the Proposed Scheme along R135 Finglas Road at Mellows Park (referred to as CBC0304BT001), along R108 Ballymun Road at Albert College Park (referred to as CBC0304BT002), at Dean Swift Bridge along R108 St. Mobhi Road (referred to as CBC0304BT003) and along R108 Phibsborough Road at Cross Guns Bridge (referred to as CBC0304BT004), and these are illustrated in Figure 12.1.1 in Volume 3 of this EIAR. The results of these surveys are described in Section 12.3.8.1.1 to Section 12.3.8.1.7 and presented in Figure 12.7.1 in Volume 3 of this EIAR.

The structure of this Section is such that each bat species is described in turn. The results of the various surveys are presented to allow an understanding of each species in terms of its distribution across the Proposed Scheme.

All bat species populations in County Dublin are valued as being of Local Importance (Higher Value) given the legal protection afforded to these species and their common presence throughout the GDA. In an Irish context, the conservation status of these species in Ireland is designated as 'Least Concern' (Marnell *et al.* 2019).

12.3.8.1.1 Leisler's bat *Nyctalus leisleri*

Leisler's bat was recorded in three of the four locations surveyed between 2018 and 2021, at CBC0304BT002 (Albert College Park), CBC0304BT003 (St. Mobhi Road), and CBC0304BT004 (R108 Phibsborough Road). A total of 19 recordings of Leisler's bat were made in these locations between 2018 and 2021. Leisler's bat activity was higher over CBC0304BT003 (St. Mobhi Road) than any other location surveyed, with nine recordings attributed to this species occurring here. There was one bat pass attributed to Leisler's bat along CBC0304BT002 (Albert College Park) and there were nine bat passes attributed to Leisler's bat along CBC0304BT004 (R108 Phibsborough Road).

Leisler's bat was detected over CBC0304BT003 (St. Mobhi Road) in autumn 2019, spring 2020 and summer 2020. In contrast, this bat species was only recorded over CBC0304BT004 (R108 Phibsborough Road), during 2018 and 2021 surveys. The results of the bat surveys as they relate to the Leisler's bat are shown on Figure 12.7.1 in Volume 3 of this EIAR.

No roost sites for Leisler's bat were recorded during any of the surveys for the Proposed Scheme.

The desk study found that Leisler's bat are known to occur across the Proposed Scheme (see Appendix A12.1 in Volume 4 of this EIAR for further details). This includes seven records of live sightings within 1km of the Proposed Scheme, including records at Dane Road and Belclare Avenue in Ballymun in 2010 and 2011, and Blessington Street Park in 2000 (NBDC 2020).

12.3.8.1.2 Common pipistrelle bat *Pipistrellus pipistrellis*

Common pipistrelle bat was recorded in all four transects surveyed between 2018 and 2021, at CBC0304BT001 (Mellowes Park), CBC0304BT002 (Albert College Park), CBC0304BT003 (St. Mobhi Road), and CBC0304BT004 (R108 Phibsborough Road). A total of 99 recordings of this species were made in these locations between 2018 and 2020, with a total of 647 recordings of this species made during the July 2021 surveys at CBC0304BT004 (R108 Phibsborough Road), the majority of which were concentrated around existing lighting columns and Cross Guns Bridge. Common pipistrelle bat activity was higher along CBC0304BT003 (St. Mobhi Road) and CBC0304BT004 (R108 Phibsborough Road), than at the two park locations (CBC0304BT001 and CBC0304BT002), with all 44 recordings of this species made in 2018 being attributed to this species (41 at CBC0304BT003 on St. Mobhi Road and three at CBC0304BT004 on R108 Phibsborough Road). Likewise, in autumn 2019, all 24 recordings of this species were split between these two locations (11 over CBC0304BT003 on St. Mobhi Road and 13 along CBC0304BT004 on R108 Phibsborough Road). Spring 2020 was the only season where common pipistrelle bats were not recorded at CBC0304BT003 (St. Mobhi Road), although two recordings of this species were made at CBC0304BT004 (R108 Phibsborough Road), three along CBC0304BT002 (Albert College Park), and four at CBC0304BT001 (Mellowes Park). In summer 2020, 22 recordings of common pipistrelle were made, again split between CBC0304BT003 (St. Mobhi Road), with 11 recordings and CBC0304BT004 (R108 Phibsborough Road) with 11 recordings. The results of the bat surveys as they relate to the common pipistrelle bat are shown on Figure 12.7.1 in Volume 3 of this EIAR .

No roost sites for common pipistrelle bat were recorded during any of the surveys for the Proposed Scheme.

The desk study found that common pipistrelle bat are known to occur across the Proposed Scheme (see Appendix A12.1 in Volume 4 of this EIAR for further details). This includes 13 records of live sightings within 1km of the Proposed Scheme, including records at Dane Road and Belclare Avenue in Ballymun in 2010 and 2011, Blessington Street Park in 2000, Santry Demesne in 2008, and in Glasnevin in 2007 and 2008 (NBDC 2020).

12.3.8.1.3 Nathusius' pipistrelle bat *Pipistrellus nathusii*

Nathusius' pipistrelle bat was recorded in one of the transects surveyed in 2021 at CBC0304BT004 (R108 Phibsborough Road). A total of five recordings of this species were made at this location all during the dusk survey

on 13 July 2021. The results of the bat surveys as they relate to the Nathusius' pipistrelle bat are shown on Figure 12.7.1 in Volume 3 of this EIAR.

No roost sites for Nathusius' pipistrelle bat were recorded during any of the surveys for the Proposed Scheme.

The desk study found that Nathusius' pipistrelle bat are known to occur within 2km of the Proposed Scheme (see Appendix A12.1 in Volume 4 of this EIAR for further details). This includes live records at Connolly Station in 2010 and two in the Phoenix Park in 2007 (NBDC 2020).

12.3.8.1.4 Soprano pipistrelle bat *Pipistrellus pygmaeus*

Soprano pipistrelle bat was recorded in two of the four locations surveyed between 2018 and 2021, at CBC0304BT003 (St. Mobhi Road), and at CBC0304BT004 (R108 Phibsborough Road). A total of 71 recordings of this bat species can be attributed to these two locations. This species was not recorded at any survey location in Spring 2020. Thirty-four recordings of soprano pipistrelle bats were recorded at CBC0304BT003 (St. Mobhi Road) in 2018, nine in autumn 2019 and 11 in summer 2020. Ten recordings of this species were also made along CBC0304BT003 (St. Mobhi Road) in summer 2020, as well as seven at CBC0304BT004 (R108 Phibsborough Road). 103 recordings of this bat species were made at CBC0304BT004 (R108 Phibsborough Road) in July 2021. The results of the bat surveys as they relate to the soprano pipistrelle bat are shown on Figure 12.7.1 in Volume 3 of this EIAR.

No roost sites for soprano pipistrelle bat were recorded during any of the surveys for the Proposed Scheme.

The desk study found that soprano pipistrelle bat are known to occur across the Proposed Scheme (see Appendix A12.1 in Volume 4 of this EIAR for further details). This includes six records of live sightings within 1km of the Proposed Scheme, including at Belclare Avenue, Ballymun in 2011, Santry Demesne in 2008, McKee Road in Finglas and Ballyboggan Road in Glasnevin in 2006 (NBDC 2020).

12.3.8.1.5 Unidentified pipistrelle species

Pipistrelle species bat calls that could not be classified as either characteristic of common or soprano pipistrelle are referred to as 'unidentified' pipistrelle species. Common pipistrelle bats have their peak echolocation call strength at 45kHz (kilohertz) and soprano pipistrelle bats at 55kHz. As such, pipistrelle bat species that echolocate between 48kHz and 52kHz cannot be accurately identified by their calls and are described as 'unidentified' pipistrelle bat species.

Unidentified pipistrelle species were recorded in only two locations surveyed between 2018 and 2020, at CBC0304BT003 (St. Mobhi Road) and at CBC0304BT004 (R108 Phibsborough Road). A total of 14 recordings between 2018 and 2020 can be attributed to unidentified pipistrelle species. In 2018, 12 recordings of unidentified pipistrelle bat were captured at CBC0304BT003 (St. Mobhi Road). In autumn 2019, one recording of unidentified pipistrelle bat was captured at CBC0304BT004 (R108 Phibsborough Road) and at CBC0304BT003 (St. Mobhi Road). No recordings of unidentified pipistrelle bats were captured during surveys undertaken in spring or summer 2020.

12.3.8.1.6 Brown long-eared bat *Plecotus auritus*

Brown long-eared bat was not recorded across the study area of the Proposed Scheme during the walked transect surveys.

No roost sites for brown long-eared bat were recorded during any of the surveys for the Proposed Scheme.

The desk study found that brown long-eared bat are known to occur within 1.5km of the Proposed Scheme (see Appendix A12.1 in Volume 4 of this EIAR for further details). This includes a record of one live sighting in Phoenix Park in 2007 (NBDC 2020).

12.3.8.1.7 *Myotis* bat species

One unidentified myotis bat was recorded at CBC0304BT003 (St. Mobhi Road) during surveys undertaken in spring 2020. This was the only *Myotis* bat detected within the locations surveyed, between 2018 and 2020. Twenty-five recordings of unidentified myotis bats were recorded at CBC0304BT004 (R108 Phibsborough Road) during surveys undertaken on 13 July 2021. The results of the bat surveys as they relate to the myotis bat species are shown on Figure 12.7.1 in Volume 3 of this EIAR.

The desk study found that *Myotis* bat species including Daubenton's bat *Myotis daubentonii*, Natterer's bat *M. nattereri*, and whiskered bat *M. mystacinus* are known to occur within 1km of the Proposed Scheme (see Appendix A12.1 in Volume 4 of this EIAR for further details). This includes several records of live sightings across the length of the Proposed Scheme (NBDC 2020). There are three records of Daubenton's bat sightings along the River Tolka at Violet Hill, Glasnevin in 2009 and one on R102 Tolka Valley Road in 2006, approximately 1.4km from the Proposed Scheme (NBDC 2020).

12.3.8.1.8 Potential Roost Features (PRFs)

The trees identified as having potential to support roosting bats (known as PRFs) are listed in Table 12.8 and are shown on Figure 12.7.2 in Volume 3 of this EIAR. Each tree, or grouping of homogenous trees, was classified with regard to their potential to support roosting bats after Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins 2016). Trees with negligible suitability for roosting bats are not described or mapped as they are assessed as not having the potential to support roosting bats.

Table 12.8: Summary of PRFs Recorded Within the Footprint of the Proposed Scheme

Reference	Species	Description
CBC0304PRF036	Monterey cypress <i>Cupressus macrocarpa</i>	Fluting
CBC0304PRF037	London Plane <i>Platanus x acerifolia</i>	Knotholes
CBC0304PRF038	London Plane <i>Platanus x acerifolia</i>	Knotholes, kankers, crevices
CBC0304PRF039	London Plane <i>Platanus x acerifolia</i>	Knotholes, crevice
CBC0304PRF040	London Plane <i>Platanus x acerifolia</i>	Pruning-cuts, knotholes
CBC0304PRF041	Sycamore <i>Acer pseudoplatanus</i>	Knotholes

Note: A description of each different type of PRF, as referred to in Table 12.8, is provided in (Andrews 2018).

12.3.8.2 Badger

Badger, and their breeding and resting places, are legally protected under the Wildlife Acts. No evidence of badger (i.e. setts or evidence of badger activity) were recorded during the multidisciplinary surveys carried out along the Proposed Scheme.

Despite this, badger are widely distributed throughout the GDA, often utilising public gardens and residential gardens. The desk study returned one record found within 1km of the Proposed Scheme (see Appendix A12.1 in Volume 4 of this EIAR for further details). This includes a live sighting in Albert College Park during 2015 (NBDC 2020). As such, it has been assumed that badger may occur in vegetated areas adjacent to the Proposed Scheme.

The local badger population is deemed to be of Local Ecological Importance (Higher Value) due to the documented presence of resident populations within the wider environment of the Proposed Scheme and are valued as being of Local Importance as they are a Wildlife Acts protected species.

12.3.8.3 Otter

Otter, and their breeding and resting places, are legally protected under the Wildlife Acts. Otter are also listed on Annex II and Annex IV of the Habitats Directive. No evidence of otter activity (i.e. sprainting posts), holts or couch sites were recorded during the multidisciplinary surveys carried out along the Proposed Scheme.

A desk study found that otter are known to occur within 1km of the Proposed Scheme and across the wider study area (see Appendix A12.1 in Volume 4 of this EIAR for further details). Records include six otter signs including

a record of a live sighting during 2018 at the Royal Canal approximately 350m from the Finglas Section of the Proposed Scheme (NBDC 2022). The River Tolka is known to support a local otter population.

The findings of a city-wide otter survey along watercourses (Macklin *et al.* 2019) noted that the River Tolka had the second highest number of otter signs in that study across the GDA. A cluster of otter activity was observed between the National Botanic Gardens and Griffith Park in Drumcondra (Macklin *et al.* 2019; NPWS 2019), within 1km upstream of the Ballymun Section of the Proposed Scheme. Additional records of otter across the River Tolka included three holts and several spraints situated approximately 4.5km upstream of the Finglas Section and further spraints, couches and prints were also noted within Tolka Valley Park, approximately 1km upstream of the Finglas Section of the Proposed Scheme (Macklin *et al.* 2019). Evidence of otter activity was not noted at the Royal Canal during the aquatic survey, and evidence of suitable marking territory was recorded as being largely absent.

The terminus of the Proposed Scheme will be situated at R148 Arran Quay adjacent to the Liffey Estuary Upper. Otter frequently use the estuary for commuting and foraging, with holts identified at Dublin Port (Macklin *et al.* 2019). Described as a regular sprainting site on the River Liffey, the MV Cill Airne Restaurant at North Wall Quay is situated approximately 2.2km downstream of the terminus of the Proposed Scheme. An active holt was also present alongside the pontoon, at this location, in a quay wall (Macklin *et al.* 2019). Otter scat was recorded at one location during the 2022 surveys along the River Tolka at the R135 Finglas Road / Ballyboggan Road Junction, immediately adjacent to the Proposed Scheme.

In an Irish context, the conservation status of otter is of 'Least Concern' (Marnell *et al.* 2019) due to population recoveries since 2009. However, it remains 'Near Threatened' at a European and Global context (Roos *et al.* 2015).

The Wicklow Mountains SAC is the closest European site designated for otter, located at a distance that is greater than 20km upstream of the Proposed Scheme (from the Liffey Estuary Upper) and is located within a different sub-catchment (Dodder_SC_010) to the Proposed Scheme (Tolka_SC_020). As such, populations of otter within the footprint of the Proposed Scheme are not deemed to be connected to the SAC population.

The national population of adult breeding female otters in the Republic of Ireland was estimated at 7,800 in the National Otter Survey of Ireland 2010/12 (Reid *et al.* 2013), which is the most recent survey of its type undertaken. The local otter population in relation to the Proposed Scheme is not likely to be in the region of 1% of the national population (e.g. 78 breeding female otters). Despite the fact that otter is of 'least concern' from an Irish perspective, considering the above, the local otter population is valued as being of County Importance given that it is distinct from the Wicklow Mountains SAC population, is unlikely to be in the region of 1% of the national population, is known to be abundant in watercourses in and around Dublin City and is likely to be >1% of the County population.

12.3.8.4 Marine Mammals

The Proposed Scheme will terminate at R148 Arran Quay at the Liffey Estuary Upper. There were no protected marine mammals identified along the Proposed Scheme during the multidisciplinary surveys. There were no dedicated marine mammal surveys carried out as part of the assessment due to the Proposed Scheme being located inland.

Harbour seal, grey seal, and harbour porpoise are known from Dublin Bay and these species are all protected under the Wildlife Acts. These species are also listed on Annex II of the Habitats Directive while all cetacean species are listed on Annex IV of the Habitats Directive.

Harbour porpoise is valued as being of International Importance, as it is listed on Annex II of the Habitats Directive and a QI species designated as part of Rockabill to Dalkey Island SAC, approximately 11.7km east of the Proposed Scheme. Harbour seal and grey seal are also listed on Annex II of the Habitats Directive and are QI species designated as part of Lambay Island SAC, approximately 17.8km east of the Proposed Scheme, and as such, are valued as Internationally Important. As such, these species are considered to be of high conservation concern.

A number of protected marine mammals are known to occur within Dublin Bay and off the Dublin coast downstream of the Proposed Scheme, including:

- Common dolphin *Delphinus delphis*;
- Common porpoise *Phocoena phocoena*;
- Minke whale *Balaenoptera acutorostrata*;
- White-beaked dolphin *Lagenorhynchus albirostris*;
- Pygmy sperm whale *Kogia breviceps*;
- Bottle-nosed dolphin *Tursiops truncatus*;
- Humpback whale *Megaptera novaeangliae*;
- Sperm whale *Physeter macrocephalus*;
- Striped dolphin *Stenella coeruleoalba*;
- Risso's dolphin *Grampus griseus*; and
- Northern bottle-nosed whale *Hyperoodon ampullatus*.

Common dolphin and bottle-nosed dolphin are common to Irish coastlines, particularly the west coast, throughout the year. There are no SACs designated for Common dolphin in Ireland, while there are two SACs designated for Bottle-nosed dolphin, The Lower River Shannon SAC and the West Connaught Coast SAC, both located along the western coast. These species are protected under the Wildlife Acts and Annex II and Annex IV of the Habitats Directive. The local population are therefore valued as County Importance.

Risso's dolphin is found in both inshore and offshore coastal waters and are occasionally sighted in Dublin Bay. Minke whales and humpback whale species are migratory and frequent Irish coastlines each year. White-beaked dolphin, sperm whale, striped dolphin, and northern bottle-nosed whale are pelagic species and are rarely sighted in Dublin Bay, favouring the offshore waters of the continental shelf. Pygmy Sperm whales are rare to the Irish coastline, with only one record identified in Dublin Bay. These species are protected under the Wildlife Acts and Annex IV of the Habitats Directive and are therefore valued as County Importance.

12.3.8.5 Other Mammal Species

No other protected mammal species were recorded during the multidisciplinary surveys carried out along the Proposed Scheme. The desk study returned records for the following terrestrial mammal species protected under the Wildlife Acts within approximately 3km of the Proposed Scheme (see Appendix A12.1 in Volume 4 of this EIAR for further details):

- Pine marten *Martes martes*;
- Red squirrel *Sciurus vulgaris*;
- Hedgehog *Erinaceus europaeus*;
- Pygmy shrew *Sorex minutus*; and
- Irish Hare *Lepus timidus* subsp. *Hibernicus*.

The local population of these species are deemed to be of Local Ecological Importance (Higher Value) due to the known presence of resident populations within the wider environment of the Proposed Scheme, which are valued as being of Local Importance as they are a Wildlife Acts protected species.

Evidence of fox *Vulpes vulpes* and rabbit *Orytolagus cuniculus* were also recorded across the study area within areas of suitable habitat. Although these species are not afforded legal protection under the Wildlife Acts, they form part of the local biodiversity resource and are noted here in that context.

12.3.9 Birds

12.3.9.1 Breeding Bird

All wild birds, and their nests and eggs, are protected under the Wildlife Acts. Some bird species are also listed on Annex I of the Birds Directive, and / or as SCIs within designated European sites.

A habitat suitability assessment for nesting kingfisher, an Annex I Bird Directive species, was conducted along the proposed Royal Canal pedestrian / cycle bridge crossing. There was no suitable nesting habitat identified within 500m upstream and downstream of the proposed Royal Canal pedestrian / cycle bridge crossing point. The Proposed Scheme will cross the River Tolka at three locations, namely, R135 Finglas Road, Glasnevin Hill, and R108 St. Mobhi Road (illustrated in Figure 12.2 in Volume 3 of this EIAR). No habitat suitability assessment was carried out along the River Tolka as instream works are not proposed. Grey wagtail and kingfisher were identified during the habitat suitability assessment for nesting birds conducted upstream at Blanchardstown and downstream around Drumcondra, along the River Tolka.

The full results of the desk study, including records of breeding bird species considered to be of conservation concern, are presented in Appendix A12.1 in Volume 4 of this EIAR. These species are considered to be KERs of the Proposed Scheme and include the following:

- SCIs, for a breeding population, of SPAs;
- Species listed under Annex I of the Birds Directive; and
- Red and Amber Birds of Conservation Concern in Ireland (BoCCI) species listed for their breeding populations (Gilbert, Stanbury and Lewis 2021).

The results of the breeding bird desk study carried out to inform this assessment are summarised below.

The desk study returned records of a total of 75 breeding bird species across the study area (i.e. Grid Squares O13 and O14). Records included 19 species listed under Annex I of the Birds Directive, 31 SCI species, and an additional 15 Red Listed and 52 Amber Listed species. This includes 16 species with breeding and wintering populations. These species are grouped into habitat preferences and are discussed below in relation to their presence within the footprint of the Proposed Scheme.

Several bird species for which records were returned in the desk study are those typically found in coastal, estuarine and intertidal habitats, such as the Liffey Estuary and Dublin Bay. Many gull, auk, shearwater and tern species breed in steep inaccessible cliffs (i.e. Howth Head), offshore islands, and Dublin Port. Seabirds such as terns, guillemots and kittiwakes nest on the cliffs and crevices of Howth Head and Rockabill Island in Dublin Bay SPA. Fulmar, shag, razorbill and gannet nest in the cliffs of Ireland's Eye SPA, which also has numbers of large gulls, cormorant and puffin (Merne and Madden 2000). Gulls favour nesting along coasts on shingle and cliffs but may utilise inland public areas for scavenging and buildings for roof nesting as per habitat preferences associated with the species as listed on BirdWatch Ireland (Birdwatch Ireland 2021). As such, some gull species may utilise buildings within the footprint of the Proposed Scheme for nesting. However, the majority of other species are not deemed likely to breed within the footprint of the Proposed Scheme. The majority of records along the Proposed Scheme comprise bird species common to suburban habitats (including residential and parkland areas), such as gull and garden bird species. Residential habitats and parkland habitats were observed in several locations across the Proposed Scheme including Mellows Park, Glasnevin Cemetery grounds, King's Inns Park, and Albert College Park. These species, therefore, are likely to use lands within the footprint of the Proposed Scheme for breeding.

Breeding species which are associated with buildings were returned from the desk study including starlings and house martins (Birdwatch Ireland 2021). Starlings and house martins occurred across the larger study area (i.e. Grid Squares O13 and O14) and may therefore utilise buildings outside the footprint of the Proposed Scheme. There are records of kestrel at Dunsink, Glasnevin and along the Royal Canal, and sparrowhawk at Tolka Valley Park and Glasnevin Cemetery grounds, and as such, these species may therefore utilise open green spaces and trees adjacent to the Proposed Scheme. No suitable habitat was identified for merlin within the footprint of the Proposed Scheme. Desk study records of this species were confined to coastal areas (i.e. Grid Squares (O13)), and therefore, this species is not deemed likely to breed within the footprint of the Proposed Scheme.

Several species of warblers and raptors which favour woodlands, agricultural lands and upland heathland areas were identified during the desk study (Appendix A12.1. in Volume 4 of this EIAR). Agricultural lands and open areas were identified at locations north and west of the Proposed Scheme. As such, some of these species may utilise the lands at these locations. Due to the urban locality of the Proposed Scheme, these habitat types are not present or are highly fragmented. Suitable agricultural habitat is located approximately 1.5km to the west and to the north of the Proposed Scheme. As such, these species are not deemed to be present in significant numbers, however they may be present in larger woodland areas surrounding the Proposed Scheme (i.e. Glasnevin

Cemetery grounds, Albert College Park, Glasnevin Woods, Griffith Park, Santry Park, Santry Demesne and Tolka Valley Park) (NBDC 2022).

Species that are known to utilise freshwater lakes, ponds, canals, and rivers in urban habitats include wagtails, coots, swans, ducks, and kingfisher (Appendix A12.1. in Volume 4 of this EIAR). Suitable habitats located within close proximity to the Proposed Scheme include: the River Tolka with known populations of mute swan, wagtails and kingfisher; the Royal Canal with known populations of wagtails and ducks (and also contains breeding populations of tufted duck *Aythya fuligula*, mute swan, mallard *Anas platyrhynchos* and moorhen *Gallinula chloropus*) (Thomas 2016); Tolka Valley Park with wagtails, kingfisher, mute swan and little egret; and the Liffey Estuary Upper with cormorant, ducks, kingfisher and mute swan (NBDC 2020).

Records of breeding birds relevant to the Proposed Scheme are listed in Table 12.9.

Table 12.9: Desk Study Records of Breeding Birds of Conservation Concern Adjacent to the Proposed Scheme

Common Name / Scientific Name / British Trust for Ornithology (BTO) Code	Distribution in the Study Area	Conservation Importance		
		BoCCI (B – Breeding / W - Wintering)	Annex I	Nearest SPA Designated for SCI Species
Grey wagtail <i>Motacilla cinerea</i> (GL)	Several records along Tolka Valley at Finglas	Red (B)	-	-
Yellowhammer <i>Emberiza citronella</i> (Y)	Within the 2km Grid O14G at St. Margaret's	Red (B)	-	-
Kingfisher <i>Alcedo atthis</i> (KF)	Tolka Valley Park; Roganstown and Knocksedan	Amber (B)	✓	River Boyne SPA (approximately 35km)
Common coot <i>Fulica atra</i> (CO)	Glasnevin	Amber (B/W)	-	Lough Ennell SPA (approximately 71km)
Common shelduck <i>Tadorna tadorna</i> (SU)	Across the Proposed Scheme	Amber (B/W)	-	North Bull Island SPA (approximately 5.7km)
Kestrel <i>Falco tinnunculus</i> (K.)	Dunsink; Glasnevin; Royal Canal	Red (B)	-	-
Linnet <i>Carduelis cannabina</i> (LI)	Balcurris; Glasnevin, Broadstone; Glasnevin Cemetery; Tolka Valley; Dublin Airport.	Amber (B)	-	-
Common starling <i>Sturnus vulgaris</i> (SG)	Santry Demesne; Kilshane; St Margaret's	Amber (B)	-	-
House sparrow <i>Passer domesticus</i> (HS)	Wellmount Avenue; Finglas West; Glasnevin Cemetery	Amber (B)	-	-
Eurasian tree sparrow <i>Passer montanus</i> (TS)	St Margaret's; Finglas	Amber (B)	-	-
European greenfinch <i>Carduelis chloris</i> (GR)	Santry Demesne; Dubber Cross; Wellmount Avenue; Glasnevin Cemetery.	Amber (B)	-	-
Goldcrest <i>Regulus regulus</i> (GC)	Dubber Cross; Tolka Valley Park, National Botanic Gardens; St Margaret's; Glasnevin Cemetery	Amber (B)	-	-
House martin <i>Delichon urbicum</i> (HM)	Dunsink; Tolka Valley Park; Broadstone; St. Margaret's	Amber (B)	-	-
Mute swan <i>Cygnus olor</i> (MS)	Tolka Valley Park; Royal Canal; Blessington Street Park	Amber (B/W)	-	-
Little egret <i>Egretta garzetta</i> (ET)	Tolka Valley Park; Richmond Road; Santry Demesne	Green (B)	✓	-

Due to the presence of suitable breeding and / or foraging habitat directly adjacent to the Proposed Scheme, the local breeding bird populations are considered to be of International Importance where they belong to SPA populations and / or are listed on Annex I of the Birds Directive. All other breeding bird populations are considered to be of Local Importance (Higher Value).

12.3.9.2 Wintering Birds

All wild birds, and their nests and eggs, are protected under the Wildlife Acts. Some bird species are also listed on Annex I of the Birds Directive, and / or as SCIs within designated European sites.

Wintering bird surveys were carried out for the Proposed Scheme at one location, at Home Farm Football Club pitch on R108 St. Mobhi Road (referred to as CBC0304WB001) (see Figure 12.1.2 in Volume 3 of this EIAR). Species identified included black-headed gull, grey heron and herring gull. Grey heron was the only bird that was frequently observed on the football pitch and neighboring treeline. Black-headed gull and herring gull were only observed once using the football pitch. Table 12.10 provides a summary of the findings of the winter bird surveys with respect to those species which are of highest conservation concern and were recorded within the winter bird survey site.

The wintering bird survey site adjacent to R108 St. Mobhi Road is maintained through cutting by Home Farm Football Club. Grass cover was high across the survey period and low in height. No disturbance was observed on the site as it was fenced off from public use, other than use by the football team. No Brent goose droppings were recorded across the survey periods.

Table 12.10: Wintering Birds of Conservation Concern Recorded at CBC00304WB001 during the Wintering Bird Surveys

Common Name / Scientific Name / BTO Code	Activity and Distribution in the Study Area	Activity and Distribution in the Study Area 2021 / 2022	Conservation Importance		
			BoCCI (B – Breeding / W - Wintering)	Annex I	Nearest SPA Designated for SCI Species
Black-headed gull <i>Chroicocephalus ridibundus</i> (BH)	One bird feeding on football pitch within transect CBC0304WB001 (28/01/2021)	Single individual foraging on football pitch within transect CBC0304WB001 (21/12/2021)	Amber (B/W)	-	South Dublin Bay and River Tolka Estuary SPA (approximately 2.8km)
Herring Gull <i>Larus argentatus</i> (HG)	One bird loafing on ground on football pitch (26/10/2021)	Single individual loafing over football pitch within transect CBC0304WB001 (26/10/2021)	Amber (B/W)	-	Ireland's Eye SPA approximately 12.7km
Grey heron <i>Ardea cinerea</i> (H.)	One bird on ground on football pitch within transect CBC0304WB001 (01/12/2020)	-	Green (B/W)	-	Wexford Harbour and Slobbs SPA approximately 96.9km

The full results of the desk study, including records of wintering bird species considered to be of conservation concern, are presented in Appendix A12.1. in Volume 4 of this EIAR. These species are considered to be KERs of the Proposed Scheme and include the following:

- SCIs, for a wintering population, of SPAs;
- Species listed under Annex I of the Birds Directive; and
- Red and Amber BoCCI species listed for their wintering populations.

The desk study returned records of a total of 42 wintering bird species across the study area (i.e. Grid Squares O13 and O14). Records included nine species listed under Annex I of the Birds Directive, 33 SCI species, and an additional 11 Red Listed and 24 Amber Listed species. This includes 16 species with breeding and wintering populations. These species are grouped into habitat preferences and are discussed below in relation to their presence within the footprint of the Proposed Scheme.

Records for wintering bird species returned in the desk study are those typically found in coastal, estuarine and intertidal habitats, such as the Liffey Estuary and Dublin Bay. These largely include seabirds, waders, waterfowl, ducks, geese, and gulls. With the exception of geese, gulls and waders utilising inland feeding sites throughout the winter months, these species are unlikely to utilise lands adjacent to the Proposed Scheme in large numbers.

The wider study area of Dublin Bay, located approximately 3km east of the Proposed Scheme, is considered of significant ornithological importance as it supports an Internationally Important population of light-bellied Brent goose. The SCI species may use open parkland and grassland adjacent to the study area for foraging purposes. A review of a study into light-bellied Brent goose inland feeding sites (Scott Cawley Ltd. 2017) has identified five known inland wintering bird feeding sites within approximately 300m of the Proposed Scheme and are listed below. The importance of a feeding site has been categorised as follows:

- A site is considered to be of major importance if a peak count of over 400 geese has been previously recorded at that site;
- A site is considered to be of high importance if a peak count of between 51 to 400 geese has been previously recorded at that site; and
- A site is considered to be of moderate importance if a peak count of between 1 to 50 geese has been previously recorded at that site (Benson 2009).

Sites within 300m of the Proposed Scheme include:

- Glasnevin / St. Vincent's Primary School (major importance), approximately 82m from the Proposed Scheme;
- Finglas / Erin's Isle GAA Club (major importance), approximately 85m from the Proposed Scheme;
- Glasnevin / DCU sports grounds (major importance), approximately 170m from the Proposed Scheme;
- Finglas / Dunsink Road (high importance), approximately 207m from the Proposed Scheme;
- Tolka Valley Park (moderate importance), approximately 262m from the Proposed Scheme; and
- Finglas / Farnham Drive Park (high importance), approximately 269m from the Proposed Scheme.

Desk study records of wintering bird species utilising lands adjacent to the Proposed Scheme are provided in Table 12.11.

Table 12.11: Desk Study Records of Wintering Birds of Conservation Concern Adjacent to the Proposed Scheme

Common Name / Scientific Name / BTO Code	Activity and Distribution in the Study Area	Conservation Importance		
		BoCCI (B – Breeding / W – Wintering)	Annex I	Nearest SPA designated for SCI species
Light-bellied Brent goose <i>Branta bernicla</i> (BG)	St. Vincent's Primary School; Farnham Drive Park; Johnstown Park; Drumcondra / Holy Cross College; Tolka Valley Park	Amber (W)	-	South Dublin Bay and River Tolka Estuary SPA (approximately 2.8km)
Eurasian oystercatcher <i>Haematopus ostralegus</i> (OC)	St. Vincent's Primary School; Johnstown Park; Holy Cross College.	Amber (B/W)	-	Malahide Estuary SPA (approximately 7.5km)
Herring gull <i>Larus argentatus</i> (HG)	Across the Proposed Scheme Glasnevin within Grid O13P; Glasnevin Cemetery; Wellmount Avenue Finglas	Amber (B/W)	-	Ireland's Eye SPA (approximately 12.5km)
Black-headed gull <i>Chroicocephalus ridibundus</i> (BH)	Grid O14L north of Ballymun; Santry Demesne, Northwood Avenue; the Quays on River Liffey	Amber (B/W)	-	South Dublin Bay and River Tolka Estuary SPA (approximately 2.8km)
Lesser black-backed gull <i>Larus fuscus</i> (LB)	Glasnevin	Amber (B/W)	-	Lambay Island SPA (approximately 17.5km)
Curlew <i>Numenius arquata</i> (CU)	Grid O13N south of Glasnevin	Red (B/W)	-	North Bull Island SPA (approximately 5.7km)

Common Name / Scientific Name / BTO Code	Activity and Distribution in the Study Area	Conservation Importance		
		BoCCI (B – Breeding / W – Wintering)	Annex I	Nearest SPA designated for SCI species
Common coot <i>Fulica atra</i> (CO)	Glasnevin	Amber (B/W)	-	Lough Ennell SPA (approximately 71km)
Common shelduck <i>Tadorna tadorna</i> (SU)	Across the Proposed Scheme	Amber (B/W)	-	North Bull Island SPA (approximately 5.7km)

Downstream of the Proposed Scheme, Dublin Bay also supports Internationally Important numbers of black-tailed godwit and bar-tailed godwit between June and September (Tierney *et al.* 2017). An additional 20 species occurred in Nationally Important numbers across Dublin Bay between 2013 and 2016. These included shelduck, wigeon, teal, pintail and shoveler recorded at Dollymount Strand and North Bull Island, while great crested grebe and ringed plover favoured Sandymount Strand. Red-breasted merganser, red-throated diver, little egret, grey heron, oystercatcher, grey plover, knot, sanderling, dunlin, curlew, greenshank, redshank, and turnstone were recorded across all areas of Dublin Bay.

Due to the presence of suitable foraging and / or roosting habitat directly adjacent to the Proposed Scheme, the local wintering bird populations are considered to be of International Importance where they belong to SPA populations and / or are listed on Annex I of the Birds Directive. All other wintering bird populations are considered to be of Local Importance (Higher Value).

12.3.10 Reptiles

Common lizard are legally protected under the Wildlife Acts. No common lizard were recorded during the multidisciplinary surveys and no suitable habitat was confirmed within the footprint of the Proposed Scheme.

The desk study did not return records of common lizard within the wider study area. This species is strongly associated with heathland and coastal dune habitats and neither habitat types were identified within the Proposed Scheme (Marnell 2002; Farren *et al.* 2010). However, it cannot be ruled out that these species are not in the wider study area.

Common lizard are deemed to be of Local Ecological Importance (Higher Value).

12.3.11 Amphibians

The common frog and the smooth newt are legally protected under the Wildlife Acts. The common frog is also listed under Annex V of the Habitats Directive. No evidence of common frogs or smooth newt were identified along the Proposed Scheme during the multidisciplinary surveys.

Suitable amphibian habitat (i.e. vegetated river banks, surface water / drainage features with stagnant, relatively unpolluted water) was identified within the footprint of the Proposed Scheme. This included areas of vegetated riverbank along the Finglas Section at Tolka Valley Park and Violet Hill Park and along the Ballymun Section on R108 St. Mobhi Drive. A drainage ditch within a scrub / rank grassland mosaic was identified immediately east of the Proposed Scheme near Santry Lodge. The drainage ditch was not considered to provide adequate amphibian habitat due to significant shading, dumping and poor water quality.

The desk study returned records for common frog and smooth newt within 1km of the Proposed Scheme. This included records of common frog across the length of the Proposed Scheme including two records at Jamestown Road in Finglas in 2008 and 2011, North Road in Finglas in 2017, St. Margaret's Road in Ballymun in 2018, three records adjacent to St. Canice's Road in Glasnevin in 2011 and 2018, Iona Road in 2010 and at Claude Road in 2018 (NBDC 2020). Results returned from a NPWS data search included one record of smooth newt at a disused railway at Broadstone in 2010 (NPWS data request 2021).

Amphibians are deemed to be of Local Ecological Importance (Higher Value).

12.3.12 Fish

Fish species are protected under the Fisheries Acts and by fishing by-laws. Atlantic salmon, river lamprey and the brook lamprey are listed on Annex II of the Habitats Directive. Electro-fishing surveys were not carried out as part of the field surveys. However, the Royal Canal was evaluated for general fisheries habitat between the 4th and 5th lock (level 4, Phibsborough).

The Proposed Scheme lies within the Tolka_SC_020 sub catchment. The River Tolka catchment covers an area of approximately 148km² from Dunshaughlin in County Meath to Dublin Bay. Eight sites on the River Tolka catchment were surveyed by IFI in September 2017. The closest monitoring locations were Mill Road at Connolly Hospital, located approximately 5.7km upstream of the Finglas Section of the Proposed Scheme and Violet Hill Drive approximately 130m downstream from the Finglas Section of Proposed Scheme. Both sites were assigned an Ecological Fish Status of 'Poor' (Matson *et al.* 2018).

12.3.12.1 Salmonid Species

The desk study returned records for Atlantic salmon on the River Tolka and Lower Liffey Estuary (Kelly *et al.* 2012). The River Liffey system supports a regionally significant population of Atlantic salmon. The Liffey Estuary serves as the natural linkage for salmon populations migrating between freshwater and marine environments (IFI Consultation 2020).

The River Tolka supports Atlantic salmon, lamprey and brown trout populations in addition to other fish species and provides a particularly important nursery function for salmonid species throughout. Salmon were recorded in the Glasnevin area in 2011. The River Tolka is regularly stocked with large, farmed trout to supplement recreational angling and bolster declining wild stocks.

The River Santry is considered non-salmonid owing to the presence of a number of impassable features to fish located toward the lower end of the system. However, brown trout were recorded in the lower reaches owing to a river restoration and greenway project along a 4,500m stretch of the River Santry by DCC (IFI Consultation 2020).

Atlantic salmon are valued as being of International Importance.

Brown trout are valued as being of Local Importance (Higher Value).

12.3.12.2 Lamprey Species

The desk study returned records for lamprey species on the River Tolka and River Liffey (in the case of river lamprey *Lampetra fluviatilis* only) (Kelly *et al.* 2012; IFI 2010). River lamprey and juvenile lamprey were recorded in the River Tolka in 2017 and recorded suitable nursing habitat upstream of the Proposed Scheme (IFI 2018).

The River Santry is not considered suitable for lamprey due to the presence of a number of impassable features to fish located toward the lower end of the system (King 2018).

The Royal Canal site (RC1) was not suitable for lamprey species given the lacustrine-like environment present (Triturus Environmental Ltd. 2020).

Lamprey populations are valued as being of National Importance.

12.3.12.3 European Eel

The desk study returned records for European eel *Anguilla anguilla* on the River Tolka, which is reported to have eels in its lower reaches (Greater Dublin Drainage 2012). The Liffey Estuary serves as the natural linkage for European eel migrating between freshwater and marine environments. Twelve European eels were recorded during a fish stock survey carried out in the Tolka Estuary in 2008 (The Central and Regional Fisheries Board 2008). The Tolka Estuary is located 3.5km downstream of the Proposed Scheme. European eel was also recorded in 2017 in the River Tolka within 1km of the Proposed Scheme (Matson *et al.* 2018).

The results of the 2020 aquatic surveys undertaken by Triturus Environmental Ltd, which were conducted along the Royal Canal between the 4th and 5th lock found that the canal offered good European eel habitat. The substrata were dominated by silt with high clay fractions (often >0.3m in depth), with scattered boulder and localised marginal cobble / gravel areas (Triturus Environmental Ltd. 2020) and it was noted that European eel were noted from this section of the Royal Canal.

This species is the most threatened fish in Irish freshwaters (King *et al.* 2011) and the alarming decline of the species in recent decades has resulted in a classification of 'Critically Endangered' (Jacoby and Gollock 2014).

European eel populations are valued as being of International Importance (Kelly *et al.* 2010)

12.3.12.4 All Other Fish Species

Fish species recorded in the Lower Liffey Estuary in 2008 under WFD monitoring included sprat *Sprattus sprattus*, sand goby *Pomatoschistus minutus*, sand smelt *Atherina presbyter*, three-spined stickleback *Gasterosteus aculeatus*, cod *Gadus morhua*, and pollack species *Pollachius* sp. (Central Fisheries Board 2009).

Water sampling was carried out along the River Tolka by IFI during 2011 and the results of this survey demonstrated very low fish diversity, with only minnow *Phoxinus phoxinus*, nine-spined stickleback *Pungitius pungitius* and three-spined stickleback.

The results of the aquatic surveys undertaken by Triturus Environmental Ltd., which were conducted along the Royal Canal between the 4th and 5th lock, found that the canal offered excellent coarse fish habitat for a range of common species including roach *Rutilus rutilus*, bream *Abramis brama*, perch *Perca fluviatilis* and pike *Esox lucius*. The well-vegetated canal sections provide valuable nursery habitat for numerous fish species, in addition to good spawning substrata in the spring / early summer months (Triturus Environmental Ltd. 2020).

These other fish species are valued as being of Local Importance (Higher Value) owing to the range of coarse fish that were recorded and the presence of nursery habitat available.

12.3.13 Invertebrates

12.3.13.1 White Clawed Crayfish

White-clawed crayfish are legally protected under the Wildlife Acts and are also listed on Annex II of the Habitats Directive. Ireland remains the only part of the EU with no introduced species of crayfish, and therefore, the Irish populations of white-clawed crayfish are of key conservation concern (NPWS 2021). No white-clawed crayfish were recorded during the aquatic surveys carried out by Triturus Environmental Ltd. along the Royal Canal between the 4th and 5th locks. However, the survey found that the canal offered good habitat suitability for crayfish at this location (Triturus Environmental Ltd. 2020).

The desk study (see Appendix A12.1 in Volume 4 of this EIAR) did not return records for white-clawed crayfish within the footprint of the Proposed Scheme. As such, white-clawed crayfish are not considered further in the assessment.

12.3.13.2 Freshwater Molluscs

No red listed freshwater mollusc species were recorded during the aquatic surveys carried out by Triturus Environmental Ltd. Along the Royal Canal survey site (Triturus Environmental Ltd. 2020).

The desk study found that glutinous snail *Myxas glutinosa* are known to occur along the Royal Canal approximately 11km west of the Proposed Scheme, with a live record identified at Collins Bridge, Lucan in 2003. Records were also returned for false orb pea mussel *Pisidium pseudosphaerium* along the Royal Canal approximately 15km west of the Proposed Scheme at Leixlip Station, Confey in 2003 (see Appendix A12.1 in Volume 4 of this EIAR). These species are listed as 'Endangered' on the Ireland Red List No. 2: Non-Marine Molluscs (Byrne *et al.* 2009). The desk study (see Appendix A12.1 in Volume 4 of this EIAR) did not return records for freshwater molluscs within close proximity of the Proposed Scheme. Given the location of records from the desk study, upstream of the Proposed Scheme along the Royal Canal, it is considered possible for these species

to be present within the proposed area of instream works within the Royal Canal. Considering their status as 'Endangered' on the Ireland Red List for Non-Marine Molluscs (Byrne *et al.* 2009), these species are considered to be of County Importance.

12.3.13.3 Marsh Fritillary

Marsh fritillary *Euphydryas aurina* are legally protected under Annex II of the Habitats Directive. Species specific surveys for marsh fritillary were not carried out as part of this assessment. In an Irish context, the conservation status of these species in Ireland is designated as 'Vulnerable' (Regan *et al.* 2010).

The desk study (see Appendix A12.1 in Volume 4 of this EIAR) did not return records for marsh fritillary within the footprint of the Proposed Scheme. Desk study records in the wider area were largely historical (pre-1980s). Recent records for marsh fritillary were identified approximately 5.7km east of the Proposed Scheme at North Bull Island in 2019. Marsh fritillary are restricted to habitats containing a low, open sward with abundant devil's-bit scabious *Succisa pratensis*, including sand dunes, calcareous grassland, fens, raised and blanket bogs, upland heaths and grasslands. These habitats were not recorded within the footprint of the Proposed Scheme. As such, marsh fritillary is not considered further in the assessment.

12.3.13.4 Other Invertebrates

The desk study (see Appendix A12.1 in Volume 4 of this EIAR) returned records for several invertebrates which are red listed on Ireland's Red List No. 4: Butterflies (Regan *et al.* 2010), Ireland's Red List No. 6: Damselflies and Dragonflies (Nelson *et al.* 2011), and the Regional Red List of Irish Bees 2006 (Fitzpatrick *et al.* 2006).

Butterfly are known to favour nectar-rich flowers which provide larval foodplants, preferred species include cock's-foot grass *Dactylis glomerata*, bird's-foot trefoil *Lotus corniculatus*, common nettle *Urtica dioica*, cuckoo flower *Cardamine pratensis*, garden nasturtium *Tropaeolum majus*, Common holly *Ilex aquifolium* and common ivy *Hedera helix* (Butterfly Conservation Ireland 2020).

Corresponding habitats along the Proposed Scheme are located in parkland with scattered trees (WD5), dry meadows and grassy verges (GS2) and amenity grasslands (GA2); present within Glasnevin Cemetery grounds, Albert College Park, Mellows Park, Tolka Valley Park and grassy verges along St. Margaret's Road and the Royal Canal Bank where suitable grasses, common nettle *Urtica dioica* and common ivy *Hedera helix* were recorded. These habitats were identified along the route of the Proposed Scheme in fragmented pockets of small and medium size. Species diversity was low in terms of foodplants in these habitats. Butterfly communities that are known to survive in highly fragmented landscapes are mobile species that can feed off a range of plants (Öckinger *et al.* 2010).

Bees favour sites with flowers including unimproved grasslands and hay meadows. These habitats were not recorded along the Proposed Scheme. The preferred foodplants for bees are native species with white, blue or yellow flowers (Fitzpatrick 2006).

Small, fragmented sites where suitable floral species were recorded along the Proposed Scheme include areas of ornamental flower beds (BC4) at Glasnevin Hill, along the perimeter of the National Botanical Gardens, Lisburn Street and within residential gardens, parkland with scattered trees (WD5) and amenity grasslands (GA2) in parks and along the banks of the River Tolka and the Royal Canal.

Bumblebees may have large ranges and require large areas with varied habitats providing long flowering periods to support viable populations. Habitat fragmentation can isolate bee species, ultimately reducing gene flow and genetic diversity, increasing their vulnerability to other stressors such as disease and internal parasites. Species with specialist foodplants or limited dispersal abilities can be particularly vulnerable to habitat loss and degradation (Biesmeijer *et al.* 2006) leading to increasing dominance by a smaller number of generalist species.

Loss of natural and semi-natural habitats has been a key driver in pollinators who require a balanced diet from a range of plant species throughout their active foraging season which lasts from early spring until late autumn (TCD 2017). There are small, isolated and fragmented sites along the route of the Proposed Scheme including; Tolka Valley Park adjacent to the Proposed Scheme, which include several areas managed by DCC and FCC, described as wildflower meadows, as part of the All-Ireland Pollinator Plan (FCC 2017). DCU, Golf Course

Superintendents Association of Ireland (GCSAI), green schools and Gaelic Athletic Association (GAA) are all partner organisations of the All-Ireland Pollinator Plan 2021-2025 (NBDC 2021).

These species favour species rich semi-natural grasslands and meadows, upland heath and sand dunes. Habitats within close proximity to the Proposed Scheme which correspond to species requirements include dry calcareous and neutral grassland, species poor dry meadows and grassy verges, and areas of ornamental planting along roadsides, parkland, and gardens. Such habitats are fragmented and highly disturbed and are therefore deemed unsuitable for significant populations of red-listed invertebrates (Biesmeijer *et al.* 2006; Öckinger *et al.* 2010). As such, other invertebrates are not considered further in the assessment.

12.3.14 Summary of Ecological Valuation and Identification of KERs

Table 12.12 summarises the ecological evaluation of all receptors taking into consideration legal protection, conservation status and local abundance. KERs are highlighted in grey in Table 12.12. Species, habitats and features not qualifying as KERs are not subjected to impact assessment in line with current best practice of assessing the impacts on what are determined to be important ecological or biodiversity features, as per the CIEEM Guidelines (CIEEM 2018) and the Guidelines for Assessment of Ecological Impacts of National Road Schemes (NRA 2009).

All designated areas for nature conservation that lie within the Zol of the Proposed Scheme are considered to be KERs given that they are sites selected specifically for biodiversity conservation and are potentially at risk of impacts from the Proposed Scheme. Those designated areas for nature conservation that lie beyond the Zol of the Proposed Scheme are not considered to be at risk of impact and are therefore not considered to be KERs.

In all cases, habitat and species valued as being of Local Importance (Higher Value), or higher, are considered to be KERs as they are important contributors to the local biodiversity resource and are of conservation concern, at least locally.

Habitats valued as being of a Local Importance (Lower Value) are not considered to be KERs in this assessment. This is not to say that they are of no biodiversity value, but that impacts on these habitat types in their local context are not likely to result in a significant effect on biodiversity. It should be noted that this relates to the impact on the habitat itself as distinct from considering the role these habitat types play in supporting KER fauna species. The impacts of the Proposed Scheme in that sense are captured and assessed under the relevant species' headings in Section 12.4.

These lower biodiversity value habitats include built or artificially created habitats, transient habitats as a result of disturbance, or those that have been highly anthropogenically modified (e.g. BL1, BL2, BL3, GA2 and WS3). These habitat types tend to be associated with residential, commercial or industrial development, roads and highly managed amenity areas. It also includes grassland habitats that are relatively species poor and improved.

In some cases, Local Importance (Lower Value) habitat can be associated with, or develop into, Higher Value habitats and where this is the case it is captured in valuing and considering whether a particular habitat type is a KER for this assessment.

Non-native invasive plant species are not considered as KERs, as they can result in negative effects on biodiversity. It is in that context that they are included within the impact assessment.

Table 12.12: Summary of Ecological Valuation and Identification of KERs

Ecological Receptor	Ecological Valuation	KER?
Designated Sites		
South Dublin Bay SAC [000210]	International Importance	Yes
North Dublin Bay SAC [000206]	International Importance	Yes
Howth Head SAC [000202]	International Importance	Yes
Rockabill to Dalkey Island SAC [003000]	International Importance	Yes
Lambay Island SAC [000204]	International Importance	Yes
South Dublin Bay and River Tolka Estuary SPA [004024]	International Importance	Yes
North Bull Island SPA [004006]	International Importance	Yes
Dalkey Islands SPA [004172]	International Importance	Yes
Howth Head Coast SPA [004113]	International Importance	Yes
Malahide Estuary SPA [004025]	International Importance	Yes
Baldoyle Bay SPA [004016]	International Importance	Yes
Rogerstown Estuary SPA [004015]	International Importance	Yes
Skerries Islands SPA [004122]	International Importance	Yes
Ireland's Eye SPA [004117]	International Importance	Yes
Lambay Island SPA [004069]	International Importance	Yes
Rockabill SPA [004014]	International Importance	Yes
The Murrrough SPA [004186]	International Importance	Yes
All other SAC or SPA sites	International Importance	No – beyond Zol
Skerries Islands NHA [001218]	National Importance	Yes
Royal Canal pNHA [002103]	National Importance	Yes
Santry Demesne pNHA [000178]	National Importance	Yes
North Dublin Bay pNHA [000206]	National Importance	Yes
South Dublin Bay pNHA [000210]	National Importance	Yes
Dolphins, Dublin Docks pNHA [000201]	National Importance	Yes
Boosterstown Marsh pNHA [001205]	National Importance	Yes
Malahide Estuary pNHA [000205]	National Importance	Yes
Baldoyle Bay pNHA [000199]	National Importance	Yes
Howth Head pNHA [000202]	National Importance	Yes
Rogerstown pNHA [000208]	National Importance	Yes
Ireland's Eye pNHA [000203]	National Importance	Yes
Lambay Island pNHA [000204]	National Importance	Yes
The Murrrough pNHA [004186]	National Importance	Yes
Dalkey Coastal Zone and Killiney Hill pNHA [001206]	National Importance	Yes
Portraine Shore pNHA [001215]	National Importance	Yes
All other NHA or pNHA sites	National Importance	No – beyond Zol
Habitats		
Flower beds and borders (BC4)	Local Importance (Lower Value)	No
Buildings and artificial surfaces (BL3)	Local Importance (Lower Value)	No
Tidal Rivers (CW2) (corresponding to Annex I habitat Estuaries [1130])	National Importance	Yes
Exposed sand, gravel or till (ED1)	Local Importance (Lower Value)	No
Spoil and bare ground (ED2)	Local Importance (Lower Value)	No

Ecological Receptor	Ecological Valuation	KER?
Recolonising bare ground (ED3)	Local Importance (Lower Value)	No
Refuse and other waste (ED5)	Negligible Importance	No
Other artificial lakes and ponds (FL8)	Local Importance (Lower Value)	No
Reed and large sedge swamps (FS1)	National – see Royal Canal pNHA	Yes
Depositing/lowland rivers (FW2)	Local Importance (Higher Value)	Yes
Canals (FW3)	National Importance – see Royal Canal pNHA	Yes
Drainage ditches (FW4)	Local Importance (Lower Value)	No
Amenity grassland (improved) (GA2)	Local Importance (Lower Value)	No
Dry meadows and grassy verges (GS2)	Local Importance (Lower Value)	No
Residential	Local Importance (Lower Value)	No
(Mixed) broadleaved woodland (WD1)	Local Importance (Higher Value)	Yes
Scattered trees and parkland (WD5)	Local Importance (Higher Value)	Yes
Hedgerows (WL1)	Local Importance (Higher Value)	Yes
Treelines (WL2)	Local Importance (Higher Value)	Yes
Scrub (WS1)	Local Importance (Lower Value)	No
Ornamental / non-native shrub (WS3)	Local Importance (Lower Value)	No
Flora Species		
Flora Species listed on the Flora Protection Order	National Importance	Yes
Flora Species on Irelands Red Lists (Vulnerable or of higher concern concern)	Local Importance (Higher Value)	Yes
All other non-Red listed flora species	Local Importance (Lower Value)	No
Non-native invasive plant species	N/A	No
Fauna Species		
Otter	County Importance	Yes
Bats	Local Importance (Higher Value)	Yes
Badger	Local Importance (Higher Value)	Yes
Marine Mammals	County Importance – International Importance	Yes
Other terrestrial mammal species protected under the Wildlife Acts	Local Importance (Higher Value)	Yes
SCI and/or Annex I bird species	International Importance	Yes
All other Red listed bird species (non-SCI or Annex I breeding populations)	Local Importance (Higher Value)	Yes
All other Amber listed bird species (non-SCI or Annex I breeding populations)	Local Importance (Higher Value)	Yes
Any other Green listed bird species (non-SCI or Annex I breeding populations)	Local Importance (Higher Value)	Yes
All other wintering bird species (non-SCI or Annex I)	Local Importance (Higher Value)	Yes
Atlantic salmon	International Importance	Yes
Brown trout	Local Importance (Higher Value)	Yes
European eel	International Importance	Yes
Lamprey Species	National Importance	Yes
All other fish species	Local Importance (Higher Value)	Yes
Amphibians	Local Importance (Higher Value)	Yes
Reptiles	Local Importance (Higher Value)	Yes
Invertebrates and Insects listed as Annex II species	International Importance	No

Ecological Receptor	Ecological Valuation	KER?
Invertebrates and Insects on Irelands Red Lists (Vulnerable or of higher conservation concern)	County Importance	Yes
All other non-Red listed Invertebrates and Insects	Local Importance (Lower Value)	No
Non-native invasive fauna species	N/A	No
Local Biodiversity Areas		
Dublin City Council's Green Infrastructure Network	County Importance	No (by virtue of works proposed along existing transport corridors and general avoidance of additional land take)
Fingal County Council's Green Infrastructure Network	County Importance	No (by virtue of works proposed along existing transport corridors and general avoidance of additional land take)

12.4 Potential Impacts

The following Section presents the assessment of potential impacts on biodiversity within the Zol of the Proposed Scheme. As outlined in Section 12.2.4, this is focused on the KERs identified in Section 12.3.14. This includes consideration of the 'Do Nothing' impact scenario (i.e. the existing trends with the potential to affect biodiversity in the absence of the Proposed Scheme).

12.4.1 Characteristics of the Proposed Scheme

A detailed description of the Proposed Scheme and construction activities are provided in Chapter 4 (Proposed Scheme Description) and Chapter 5 (Construction). The main characteristics of the Proposed Scheme of relevance to the ecological assessment are outlined under the Construction and Operational Phases in Section 12.4.1.1 and Section 12.4.1.2.

12.4.1.1 Construction Phase

The main characteristics of the Construction Phase of the Proposed Scheme that have potential for ecological impact are:

- Site preparation and clearance;
- Removal of existing boundaries, pavements, lighting columns, bus stops, and signage;
- Protection and / or diversion of buried services;
- Reconnection of existing and new drainage infrastructure into the existing surface water drainage infrastructure;
- Road widening, pavement reconstruction, and kerb improvements;
- Temporary and permanent land take at a number of key areas including:
 - Royal Canal pNHA at Cross Guns Bridge; and
 - Home Farm Football Club on R108 St. Mobhi Road - Road frontage.
- Installation of new bus stops and junction / roundabout modification;
- Property boundary reinstatement, signage replacement;
- Installation of lighting columns;
- Landscaping and tree planting; and
- Reinstatement of temporary land acquisitions.

12.4.1.1.1 Structural Works / Demolition Works

Full details of the main structural works that form the Proposed Scheme can be found in Chapter 4 (Proposed Scheme Description) and Chapter 5 (Construction) of this EIAR.

12.4.1.1.2 Drainage Infrastructure

The drainage system for the Proposed Scheme will discharge to four surface water receptors: Santry_010, Tolka_050, Tolka_060, Liffey Estuary Upper and Ringsend Wastewater Treatment Plant (WwTP), which then discharges to Liffey Estuary Lower, before ultimately draining to Dublin Bay. All drainage outfall discharges to surface waters represent point discharges. For the Proposed Scheme, there will be a net increase of 2,402m² in the impermeable area ultimately discharging to Dublin Bay. The drainage design principles ensure that all runoff from increases in impermeable areas will be attenuated and there will be no net increase in the surface water flow discharged to these receptors.

Full details of proposed drainage infrastructure are provided in Chapter 13 (Water), and the Proposed Surface Water Drainage Works drawings [BCIDD-ROT-DNG_RD-0304_XX_00-DR-CD-9001] in Volume 3 of this EIAR.

12.4.1.1.3 Lighting

The majority of the Proposed Scheme is already artificially lit. However, temporary lighting may be required along the Proposed Scheme at certain locations during the Construction Phase. A number of existing / permanent lighting columns proposed to be relocated or replaced are also proposed as part of the lighting strategy, the details of which are addressed in Chapter 4 (Proposed Scheme Description) of this EIAR.

12.4.1.1.4 Landscape and Urban Realm

There will be localised replanting to compensate for localised loss of vegetation across the Proposed Scheme, full details of which are included in the Landscape and Urban Realm General Arrangement drawings (BCIDD-ROT-ENV_LA-0304_XX_00-DR-LL-9001) in Volume 4 of this EIAR. Key areas of the design consideration include the Ballymun Section and the Finglas Section of the Proposed Scheme with well developed, mature trees in localised areas such as R108 St. Mobhi Road, in and around the main parks, in the vicinity of the River Tolka and the Botanic Gardens, as well as Hart's Corner. Existing trees in good conditions are to be kept, wherever possible, and fully protected during construction. Areas of semi-natural / reduced management vegetation in good condition are to be kept, while the medians throughout most of the north part of the Proposed Scheme will provide a good opportunity for natural wildflowers and shrubs to be installed, thus contributing to increasing biodiversity and ecological resilience. In terms of urban realm, new enlarged pedestrian areas such as the area immediately surrounding Structure No. 4: North Circular Road Underpass, will feature new green ornamental planting and urban furniture while the areas identified as hotspots will also include a more differentiated design with different paving materials.

12.4.1.1.5 Construction Compounds

Six Construction Compound locations have been selected based on where most space is available in close proximity to the majority of the Proposed Scheme major works and with access to the National and Regional Road network. The Construction Compounds will be located at the following sites:

- Construction Compound B1: North-eastern corner of Santry Cross;
- Construction Compound B2: St. Mobhi Drive;
- Construction Compound B3: Constitution Hill / Catherine Lane North Junction;
- Construction Compound F1: Mellows Park in the vicinity of St. Margaret's Road Roundabout;
- Construction Compound F2: Finglas Road / Finglas Place Junction; and
- Construction Compound F3: Claremont Lawns (opposite Glasnevin Cemetery).

Full details of the Construction Compounds including siting and layout are provided in Chapter 5 (Construction) of this EIAR.

12.4.1.1.6 Estimated Project Duration

The total Construction Phase for the overall Proposed Scheme is estimated at approximately 24 months. However, individual activities will have shorter durations.

12.4.1.2 Operational Phase

The main characteristics of the Operational Phase of the Proposed Scheme that have potential for ecological impact are:

- The presence and operation (traffic) of the road;
- The presence of additional lighting; and
- Routine maintenance.

12.4.2 'Do Nothing' Scenario

In the Do Nothing scenario, the Proposed Scheme would not be implemented (discussed further in Chapter 6 (Traffic & Transport)). Thus, the existing corridors would remain with no immediate significant changes in the terrestrial, aquatic and marine biodiversity (flora and fauna) of the area, as there would be no significant Construction Phase impacts from the Proposed Scheme beyond roadside management of existing habitats. The impact of no construction is neutral upon biodiversity along and adjacent to the Proposed Scheme.

The baseline environment (see Section 12.3) describes the existing land use surrounding the Proposed Scheme. The GDA is highly urbanised with existing trends resulting in added pressure to water resources and habitat losses to ongoing development. As the full extent of the Proposed Scheme will pass through lands zoned under the Fingal County Development Plan 2016-2022 (FCC 2016) and the Dublin City Development Plan 2016 - 2022 (DCC 2016), the current land use zonings provide the best indication of what the future short to medium-term biodiversity trends might be, as they will influence and direct development in the surrounding area. Lands surrounding the Proposed Scheme are largely zoned for residential, commercial or industrial purposes. Current biodiversity trends are likely to continue in areas zoned for development, adding to pressures on water bodies and habitat fragmentation. It is also likely that traffic numbers will continue to remain high on a road network with variable drainage control or pollution control measures, which may have effects on biodiversity receptors in the baseline environment. However, any effects on biodiversity are likely to be moderated by the environmental protective policies in the Fingal County Development Plan 2016-2022 and the Dublin City Development Plan 2016 - 2022 and overarching pollution control objectives in the River Basin Management Plan (RBMP) 2018-2021 (DHPLG 2018).

12.4.3 Construction Phase

12.4.3.1 Designated Areas for Nature Conservation

This Section describes and assesses the potential for the Proposed Scheme to result in likely significant effects on designated areas for nature conservation at SACs, SPAs, NHAs or pNHAs. In the context of European sites, this is focused on the habitats and species for which the sites are selected (i.e. QIs for SACs and SCI species for SPAs, and the conservation objectives supporting their conservation status in each site). This assessment is directly related to the assessment methodology for European sites required under the Habitats Directive, which is presented separately in the NIS prepared for the Proposed Scheme (and submitted with the application for approval).

In the case of NHAs and pNHAs the assessment considers whether the integrity of any such site would be affected. For the avoidance of doubt, it should be noted that, if the Proposed Scheme would adversely affect the integrity of a European site, then this would constitute a likely significant effect in the context of the EIA Directive.

12.4.3.1.1 European sites

In the context of assessing whether the Proposed Scheme is likely to result in an impact on the integrity of any European sites, the NIS considers whether the Proposed Scheme will affect the conservation objectives supporting the favourable conservation condition of any European site's QIs / SCIs and as a result presents an

assessment of whether the integrity of any European sites would be affected (i.e. if the Proposed Scheme would adversely affect the integrity of a European site), as this would constitute a likely significant effect in the context of the EIA Directive.

In view of best scientific knowledge and in view of conservation objectives, the nature and scale of the Proposed Scheme, and the identified potential impacts and their relationship to European sites were considered in order to determine which European sites were located within the Zol of the Proposed Scheme, and therefore potentially at risk of the Proposed Scheme affecting their conservation objectives. The potential impacts associated with the Proposed Scheme are discussed below in relation to those European sites within its Zol (further information can also be found in Section 5.1 and Section 6 of the NIS).

The Zol is a distance within which the Proposed Scheme could potentially affect the conservation condition of QI habitats or QI / SCI species of a European site.

The mechanism to define the Zol is summarised as follows:

- Consider the nature, size and location of the Proposed Scheme;
- Consider the sensitivities of the ecological receptors;
- Identify impact sources and pathways; and
- Determine the Zol based on the extent of the impact.

Considering the Zol, in the absence of mitigation measures, the Proposed Scheme was assessed as having the potential to adversely affect the integrity of the following European sites:

- South Dublin Bay SAC [000210];
- North Dublin Bay SAC [000206];
- Howth Head SAC [000202]
- Rockabill to Dalkey Island SAC [003000];
- Lambay Island SAC [000204]
- North Bull Island SPA [004006];
- South Dublin Bay and River Tolka Estuary SPA [004024];
- Dalkey Islands SPA [004172];
- Howth Head Coast SPA [004113];
- Malahide Estuary SPA [004025];
- Baldoyle Bay SPA [004016];
- Rogerstown Estuary SPA [004015];
- Skerries Islands SPA [004122];
- Ireland's Eye SPA [004117];
- Lambay Island SPA [004069];
- Rockabill SPA [004014]; and
- The Murrrough SPA [004186].

The locations of these European sites, relative to the Proposed Scheme, are shown on Figure 12.3 in Volume 3 of this EIAR.

The following potential effects on European sites have been identified based on the existing baseline ecological environment and the extent and characteristics of the Proposed Scheme (see information provided below for a detailed description of each potential impact):

- Habitat loss and fragmentation;
- Habitat degradation / effects on QI / SCI species as a result of hydrological impacts;
- Habitat degradation as a result of introducing / spreading non-native invasive species; and
- Disturbance and displacement impacts.

Habitat degradation as a result of hydrogeological impacts and air quality impacts were scoped out from further assessment at the AA Screening stage. The nearest European site is South Dublin Bay and River Tolka Estuary SPA which is located approximately 2.7km from the Proposed Scheme and lies outside of the Zol for these impacts. Therefore, there is no potential for an impact on European sites.

12.4.3.1.1.1 Habitat Loss and Fragmentation

The Proposed Scheme will not overlap with any European sites. The nearest European site is South Dublin Bay and River Tolka Estuary SPA which is located approximately 2.7km from the Proposed Scheme, and therefore, there is no potential for direct habitat loss and fragmentation. Habitat loss may occur indirectly as a consequence of severe habitat degradation arising from a reduction in water quality and / or a change to the hydrological regime, as described in Section 12.4.3.1.1.2.

SCI species for which SPAs in the vicinity of the Proposed Scheme have been designated are known to utilise *ex situ* feeding sites in the Dublin area (i.e. Malahide Estuary SPA, Baldoyle Bay SPA, North Bull Island SPA, South Dublin Bay and River Tolka SPA and Rogerstown Estuary SPA, Skerries Islands SPA, Ireland's Eye SPA, Lambay Island SPA, Rockabill SPA and the Murrough SPA). The Proposed Scheme will not result in the loss of sites suitable to support breeding gull and wintering bird species (i.e. Home Farm Football Club on R108 St. Mobhi Road). Therefore, there is no potential for impacts on SCI species associated with SPAs to occur as a result of habitat loss / fragmentation.

12.4.3.1.1.2 Habitat Degradation / Effects on QI / SCI Species as a result of Hydrological Impacts

The Proposed Scheme is hydrologically connected to Dublin Bay as a result of surface waters from the footprint of the Proposed Scheme via the River Tolka, the Royal Canal, Claremont Stream and Bachelors Stream, and the public sewer which will be treated at Ringsend WwTP prior to subsequent discharge to Dublin Bay via the Liffey Estuary Lower. The release of contaminated surface water runoff and / or an accidental spillage or pollution event into any surface water features during construction has the potential to affect water quality in the receiving aquatic environment. Such a pollution event may include the release of sediment into receiving waters and the subsequent increase in mobilised suspended solids, and the accidental spillage and / or leaks of contaminants (i.e. fuel, oils, chemicals and concrete washings) into receiving waters.

The associated effects of a reduction of surface water quality following a significant pollution event could potentially extend for a considerable distance downstream of the location of the accidental pollution event or the discharge point, and therefore impact the downstream environment (i.e. Dublin Bay), within which European sites are located (i.e. North Dublin Bay SAC, South Dublin Bay SAC, Howth Head SAC, Rockabill to Dalkey Island SAC, North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA and Dalkey Islands SPA). This reduction in water quality (either alone or in combination with other pressures on water quality) could result in the degradation of sensitive habitats present within these European sites, which in turn would negatively affect the SCI bird species and QI species that rely upon these habitats as foraging and / or roosting habitat. It could also negatively affect the quantity and quality of prey available to QI and SCI species. These potential impacts could occur to such a degree that the conservation objectives of the North Dublin Bay SAC, South Dublin Bay SAC, Howth Head SAC, Rockabill to Dalkey Island SAC, Lambay Island SAC, North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA, Howth Head Coast SPA, Skerries Islands SPA, Rockabill SPA, Lambay Island SPA, Ireland's Eye SPA, Dalkey Islands SPA, Baldoyle Bay SPA, Malahide Estuary SPA, Rogerstown SPA and The Murrough SPA are undermined.

In a worst-case scenario, the release of contaminated surface water runoff and / or an accidental spillage or pollution event into any surface water features during construction, also has the potential to affect SCI bird species and QI mammal species that commute, forage and loaf in the Liffey Estuary Upper / Lower and areas of Dublin Bay (i.e. birds associated with Skerries Islands SPA, Rockabill SPA, Lambay Island SPA, Ireland's Eye SPA, North Dublin Bay SPA, South Dublin Bay and River Tolka Estuary SPA, Baldoyle Bay SPA, Malahide Estuary SPA, Rogerstown SPA, Dalkey Islands SPA, Murrough SPA and marine mammals associated with Rockabill to Dalkey Island SAC and Lambay Island SAC). This reduction in water quality (either alone or in combination with other pressures on water quality) could result in the degradation of sensitive habitats present downstream, which in turn could negatively affect the SCI bird species that rely upon these habitats as foraging and / or roosting habitat. It could also negatively affect the quantity and quality of prey available to SCI and QI populations. In a worst-case scenario these potential hydrological impacts could occur to such a degree that the conservation

objectives of the Skerries Islands SPA, Rockabill SPA, Lambay Island SPA, Ireland's Eye SPA, North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA, Malahide Estuary SPA, Rogerstown SPA, Baldoyle Bay SPA, Howth Head Coast SPA, Dalkey Islands SPA, Murrrough SPA, North Dublin Bay SAC, South Dublin Bay SAC, Howth Head SAC, Rockabill to Dalkey Island SAC and Lambay Island SAC are undermined.

12.4.3.1.1.3 Habitat Degradation as a Result of Introducing / Spreading Non-Native Invasive Species

Four non-native invasive plant species, listed on the Third Schedule of the Birds and Habitats Regulations were present in five locations within, or in close proximity to the Proposed Scheme.

In addition, records of invasive species in the vicinity of the Proposed Scheme were returned from the desk study. Therefore, in the absence of mitigation there is potential for invasive species to spread or be introduced during construction to terrestrial habitat areas in European sites downstream in Dublin Bay (i.e. North Dublin Bay SAC, South Dublin Bay SAC, North Bull Island SPA and South Dublin Bay and River Tolka Estuary SPA). These in turn may result in the degradation of the existing habitats and therefore undermine the conservation objectives of these European sites.

As the Proposed Scheme has the potential to result in habitat degradation of the QI / SCI species of European sites as the result of the spread of invasive species, there is the potential for in combination effects to occur in association with other activities / plans / projects.

12.4.3.1.1.4 Disturbance and Displacement Impacts

There are no European sites within the disturbance Zol of the Proposed Scheme. However, several QI species are known to occur within the vicinity of the Proposed Scheme. Refer to Section 12.4.3.4 and Section 12.4.3.8 for more details with regards to potential construction impacts on QI mammals and fish, respectively.

There are no European sites within the disturbance Zol of the Proposed Scheme. However, there are a number of SPAs located in relatively close proximity to the Proposed Scheme which are designated for SCI species that are known to forage and / or roost at inland sites, such as amenity grassland playing pitches (i.e. Malahide Estuary SPA, Baldoyle Bay SPA, Rogerstown Estuary SPA, North Bull Island SPA, South Dublin Bay and River Tolka SPA, Ireland's Eye SPA, Skerries Islands SPA, Lambay Island SPA and The Murrrough SPA). These species include light-bellied Brent goose, curlew, oystercatcher, black-headed gull, herring gull and lesser black-backed gull. Suitable inland foraging / roosting sites, which these bird species utilise, are located within the potential Zol of the Proposed Scheme. Therefore, there is potential for the Proposed Scheme to result in disturbance / displacement impacts on SCI populations associated with European sites.

Evidence of otter activity was recorded outside the Proposed Scheme further upstream and downstream of the Proposed Scheme along the River Tolka. The River Tolka is known to support otter, an Annex II and IV mammal species. The nearest SAC to the Proposed Scheme for which otter has been designated is the Wicklow Mountains SAC which is located approximately 11.9km south (as the crow flies). Research carried out by Ó Néill *et al.* (2009) on ranging behaviours of otter on river systems in Ireland found that female otter ranges averaged 7.5km while male otter home ranges varied between 7km to 21km. The Proposed Scheme is located within the Tolka_SC_020 sub-catchment, and therefore, it is in a different sub-catchment to where the Wicklow Mountains SAC is located. While the River Tolka is known to support otter, current guidance in respect of the hydrological distance that territorial otters roam suggest a maximum territorial range of 21km for otter along suitable watercourses. Thus, watercourses in proximity to the Proposed Scheme are not considered to be associated with QI populations associated with the Wicklow Mountains SAC, by virtue of distance. Non QI otter are dealt with separately in Section 12.4.3.4.3.

Marine mammals associated with European sites may commute and forage within the Liffey Estuary. It is not considered to be likely that there will be any impacts on these species as a result of the Proposed Scheme as the terminus at R148 Arran Quay is located approximately 8.8km upstream of Dublin Bay, in a highly urbanised environment and where water levels can drop diurnally, reducing the likelihood of marine mammals venturing this far up-river. In addition to this, the scale of works proposed in the vicinity of the Liffey Estuary are considered to be minor.

12.4.3.1.2 NHAs and pNHAs

In the case of NHAs and pNHAs, the assessment considers whether the integrity of any such site would be affected by the Proposed Scheme, with reference to the ecological features for which the site is designated or is proposed for designation.

Considering the Zol of the Proposed Scheme, in the absence of mitigation measures, the Proposed Scheme has the potential to have a likely significant effect upon the following one NHA and 14 pNHAs:

- Skerries Islands NHA [001218]
- Royal Canal pNHA [002103];
- North Dublin Bay pNHA [000206];
- South Dublin Bay pNHA [000210];
- Dolphins, Dublin Docks pNHA [000201];
- Booterstown Marsh pNHA [001205];
- Portraine Shore pNHA [001215]
- Howth Head pNHA [000202];
- Dalkey Coastal Zone and Killiney Hill pNHA [001206];
- Malahide Estuary pNHA [000205];
- Baldoyle Bay pNHA [000199];
- Rogerstown pNHA [000208];
- Ireland's Eye pNHA [000203];
- Lambay Island pNHA [000204]; and
- The Murrrough pNHA [000730].

The locations of these designated areas for nature conservation, relative to the Proposed Scheme, and the predicted Zol, are shown on Figure 12.4 in Volume 3 of this EIAR.

The potential effects on European sites arising from the Proposed Scheme, described in Section 12.4.3.1.1 may also negatively affect the pNHA sites located within the boundaries of these European sites. These pNHA sites comprise of North Dublin Bay pNHA, South Dublin Bay pNHA, Dolphins, Dublin Docks pNHA, Booterstown Marsh pNHA, Howth Head pNHA, Dalkey Coastal Zone and Killiney Hill pNHA, Malahide Estuary pNHA, Baldoyle Bay pNHA, Rogerstown pNHA, Portraine Shore pNHA, Ireland's Eye pNHA, Lambay Island pNHA and The Murrrough pNHA. These sites are primarily designated for similar reasons. The Proposed Scheme will have the potential to affect biodiversity in a broader sense than just the QIs / SCIs of those European sites. Where biodiversity receptors in these NHA and pNHAs do not form part of the QIs / SCIs in the NIS assessment, they are considered under the other individual impact assessment headings for each KER below. Potential impacts arising from the Proposed Scheme on these NHA and pNHA sites would result in a likely Negative and Significant effect at a National geographic scale.

The assessment of potential impacts arising from the Proposed Scheme on the Royal Canal pNHA, include habitat loss and fragmentation, habitat degradation as a result of surface water quality effects, habitat degradation as a result of air quality effects and the spread of non-native invasive species (see Section 12.4.3.2), effects on rare and protected plant species (see Section 12.4.3.3), and negative effects on the protected fauna species associated with these sites such as mammals, riparian birds, and fish species (see Section 12.4.3.4, Section 12.4.3.5 and Section 12.4.3.8).

12.4.3.1.2.1 Habitat Loss and Fragmentation

The Proposed Scheme will overlap with the Royal Canal pNHA and the proposed Royal Canal pedestrian / cycle bridge will be built to cross the Royal Canal. During construction, one of the abutments will be built within the Royal Canal, resulting in the permanent loss, albeit of a relatively small area of aquatic territory as well as a temporary loss of 0.035ha of canal habitat and a limited extent of riparian corridor along one bank. It will also result in the potential fragmentation of habitat for species such as otter that are known to occur in the area. Therefore, the loss of territory, albeit limited, has the potential to result in Negative and Significant effects at a Local geographic scale.

12.4.3.1.2.2 Habitat Degradation – Surface Water Quality

During construction, the Proposed Scheme works within the Royal Canal itself will result in the disturbance of and release of suspended solids, within the water body and with the potential for its effects to be noticed downstream. This will be a localised event of short duration given that the water levels will be dropped and thereafter dry working areas will be installed.

The River Santry, which flows through the Santry Demesne pNHA, will potentially be impacted via outflows from the surface water drainage network in the northern portion of the Ballymun Section of the Proposed Scheme.

Contaminated surface water runoff and / or an accidental spillage or pollution event directly into the Royal Canal or River Santry or indirectly via any surface water feature has the potential to have Negative and Significant impacts on water quality and consequently affect aquatic and wetland habitats in the receiving environment. The effects of frequent and / or prolonged pollution events have the potential to be extensive and far-reaching and could potentially have significant long-term effects. In a worst-case scenario, large extents of the Royal Canal or River Santry downstream could also be affected. It is considered unlikely that a pollution event of such a magnitude would occur during construction, or if it did occur, it would be temporary in nature. Nevertheless, a precautionary approach has been adopted in the assessment of potential risk of impacts on water quality. Consequently, detailed mitigation measures are required to further minimise the risk of contaminated surface water runoff and / or an accidental spillage or pollution event having any perceptible effect on water quality during construction of the Proposed Scheme.

12.4.3.1.2.3 Habitat Degradation – Hydrological Regime

During the Construction Phase, the potential for temporary disruption to local drainage systems and hydrological regimes have been assessed in relation to the Proposed Scheme. This is not predicted to result in a likely significant negative effect on any aquatic habitats or species through effects on the hydrological regime with the exception of the Royal Canal (for more detail refer to Chapter 13 (Water)). The provision, to enable working in the dry, of the lowering of the Royal Canal water levels to 0.5m for the extent of works at the proposed pedestrian / cycle bridge will have a Negative, Significant and Temporary effect, likely at the Local geographic scale, as this water level lowering will be constrained to between Locks 4 and 5.

12.4.3.1.2.4 Habitat Degradation – Groundwater

The potential for hydrogeological impacts are highly variable depending on the nature of the proposed works at specific locations and the receiving environment ground conditions. The unmitigated hydrogeological ZoI of the Proposed Scheme is not considered to extend to any groundwater-dependent terrestrial ecosystems linked to European sites. However, it could extend to the Royal Canal and by virtue of location and the nature of the works, could result in a Negative, Significant and Temporary effect, likely at a Local geographical scale.

Mitigation measures, as described in Section 12.5.1 will address these potential impacts.

12.4.3.1.2.5 Habitat Degradation as a Result of Introducing / Spreading Non-Native Invasive Species

A third schedule aquatic species was recorded during the aquatic survey at the Royal Canal. Nuttall's waterweed (along with the delisted Canadian waterweed) are freshwater species. It is considered likely that these species could spread or be introduced to downstream sections of the Royal Canal, however it is not considered likely that they could spread or be introduced to European sites located downstream in Dublin Bay.

Mitigation measures have been designed to avoid this potential impact (see Section 12.5.1).

12.4.3.1.2.6 Habitat Degradation – Air Quality

Dust Emissions

Dust emissions associated with construction works could, in extreme circumstances, affect adjoining habitats, potentially burying sensitive habitats or plant species. Best practice construction methodologies and mitigation measures have been designed to minimise construction generated dust and to contain it within the Proposed

Scheme boundary. Mitigation measures in respect of construction dust are provided in Section 7.5.1 of Chapter 7 (Air Quality).

Vehicle Derived Emissions

During the Construction Phase of the Proposed Scheme, emissions from car exhausts, and the deposition of particulate matter (PM) and heavy metals produced by engine, brake and tyre wear of construction vehicles, can contribute to increased deposition of pollutants such as oxides of nitrogen (NO_x, NO₂) and PM in the vicinity of a road carriageway. This can affect the ecosystems and vegetation present, influencing plant growth rates and species composition, diversity, and abundance.

The current understanding of air quality impacts from roads and their interaction / effects on ecology are set out in the TII guidance document Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (NRA 2011) and three UK reports: The Ecological Effects of Diffuse Air Pollution from Road Transport (Signal *et al.* 2004), The Ecological Effects of Air Pollution from Road Transport: An Updated Review (Natural England 2016), and Advice on Ecological Assessment of Air Quality Impacts (CIEEM 2021).

An assessment of the impact of the Proposed Scheme has been undertaken using the approach outlined in A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.1) (IAQM 2020). Vehicle-derived air emissions were modelled during the Construction Phase along the proposed road development at the Royal Canal pNHA crossing, as well as several crossing points outside of the Proposed Scheme (refer to Section 7.4.2.2.4 of Chapter 7 (Air Quality) for details). However, some of these vehicle-derived air emissions may be part of the extended road network as a result of traffic redistribution effects (e.g. Royal Canal at Binn's Bridge, Drumcondra) (refer to Chapter 7 (Air Quality) for details). The worst-case predicted annual average NO_x concentrations at various distances from the proposed road edge exceed the 30µg/m³ (micrograms per metre cubed) limit value. In all cases where exceedances occur, the baseline environment is already in excess of this value. During the Construction Year (2024) of the Proposed Scheme, annual mean NO_x concentrations are predicted to decrease at Cross Guns Bridge over the Royal Canal and experience a slight and temporary increase at Binns Bridge due to traffic redistribution effects. During the Construction Phase of the Proposed Scheme, NO_x concentrations are deemed as Negative, Slight and Short-Term.

The contribution of the Construction Phase of the Proposed Scheme to the NO₂ dry deposition rate was modelled at the Royal Canal pNHA. Nitrogen deposition levels have been compared to the lower and higher critical loads for habitats associated with the Royal Canal pNHA. These include Canals (FW3), Dry Meadow / Grassy Verges (GS2), Reed and Large Sedge Swamps (FS1) and Tall-herb Swamps (FS2). The majority of sites are below the lower critical load of inland and surface water habitats of 5 to 10kg(N)/ha/yr (kilograms of Nitrogen per hectare per year) (NRA 2011) and their levels remain close to existing levels during the Construction Phase (i.e. ranging from -1% to 2% relative change). There is one modelled location where the lower critical load of 5kg(N)/ha/yr is exceeded (Royal Canal pNHA at Binns Bridge west). NO₂ dry deposition rates are modelled to be in excess of this value without the construction of the Proposed Scheme. The construction of the Proposed Scheme is not considered to increase this value significantly and will be temporary, and therefore, harmful effects on vegetation within the Royal Canal pNHA from NO₂ are not likely, nor will there be any reduction in habitat area of the pNHA habitats. This will likely result in a Significant and Temporary impact, at the Local geographic scale, which cannot be mitigated for.

The Proposed Scheme is located within a highly urbanised locality with significant development in the surrounding area. It is likely that barrier effects may therefore limit the geographical extent of deposition, Tong *et al.* (2016) identified the effectiveness of vegetative barriers as reducers of airborne PM. They found that the most effective combination to reduce the pollutant escape is wide barriers with high leaf area density combined with solid barriers. The Proposed Scheme is unlikely to significantly change from the existing urban environment in terms of the annual mean PM₁₀ and PM_{2.5} concentrations at all modelled receptors (refer to Section 7.4.3.2 in Chapter 7 (Air Quality) for details). Therefore, impacts on vegetation within the pNHA from PM or HM are not likely.

Mitigation measures have been designed to avoid this potential impact (see Section 12.5.1).

12.4.3.2 Habitats

This Section assesses the potential impacts of the Proposed Scheme on habitats. In terms of quantifying the magnitude of effects on habitats, the estimated percentage of the local habitat resource being affected is based

upon the total area of a given habitat type that was recorded within the study area of the Proposed Scheme. This provides some local context as to the magnitude of the habitat loss and whether the impact is significant or not, and at what geographic scale.

12.4.3.2.1 Habitat Loss and Fragmentation

The totality of habitat across the Proposed Scheme (not considering building and other hardstanding areas) is approximately 4.38ha. The habitat type tidal rivers (CW2), which is considered to be of National Importance given its Annex I status under the Habitats Directive (i.e. Estuaries [1130]) refers to the Liffey Estuary Upper which is located at the proposed terminus of the Proposed Scheme at R148 Arran Quay. This habitat will not be directly affected by the Proposed Scheme, and therefore, there is no potential for significant negative effects at any geographic scale.

The habitat types, canals (FW3) and reed and large sedge swamps (FS1), will be affected by the Proposed Scheme and are also considered to be of National Importance as they are contained within the boundaries and form constituent parts of the Royal Canal pNHA. The Proposed Scheme will cross the Royal Canal at the existing Cross Guns Bridge and the proposed Royal Canal pedestrian / cycle bridge. There will be some permanent loss of this habitat type. The total area of this habitat type which overlaps with the Proposed Scheme is approximately 563m² (which encompasses the entirety of the proposed finished bridge structure). However, the permanent loss of canal habitat is restricted to a small portion of the canal muds, to be utilised as a portion of the supporting abutment, and a small portion of riparian vegetation (FS1) to accommodate the works area. The permanent loss of canal habitat (albeit relatively small in comparison with the full extent of the Royal Canal), is considered to be of National Importance, has the potential to affect its conservation status, and therefore, will result in a Negative and Significant impact at the Local geographic scale.

The habitat type depositing / lowland rivers (FW2) may also be affected by the Proposed Scheme and is considered to be of Local Importance (Higher Value). The River Tolka, Claremont Stream and Bachelors Stream are all present within the Proposed Scheme. There will be no permanent loss of this habitat type as a result of the Proposed Scheme. Therefore, there is no potential for significant effects at any geographic scale.

Habitat types considered to be of Local Importance (Higher Value) will be lost as a result of the Proposed Scheme. These include relatively small areas of (mixed) broadleaved woodland (WD1), scattered trees and parkland (WD5), hedgerow (WL1) and treeline (WL2) habitats, the majority of which consists of roadside edge habitat and trees with losses usually limited to within several metres of the roadside edge. The overall total number of trees within the habitat types which overlap with the Proposed Scheme boundary and will be directly lost as a result of the construction of the Proposed Scheme is approximately 276 trees. The permanent loss of habitat types is considered to be of Local Importance (Higher Value) and has the potential to affect the conservation status of each of these habitat types, and therefore, will result in a Negative and Significant impact at the Local geographic scale.

The remaining areas within the footprint of the Proposed Scheme comprise of habitats considered to be of Local Importance (Lower Value) or negligible value. These include flower beds and borders (BC4), drainage ditches (FW4), exposed sand, gravel or till (ED1), spoil and bare ground (ED2), recolonising bare ground (ED3), amenity grassland (improved) (GA2), dry meadows and grassy verges (GS2), residential, scrub (WS1), ornamental / non-native shrub (WS3), buildings and artificial surfaces (BL3) and refuse and other waste (ED5) habitat. The overall total area of these habitat types which overlap with the Proposed Scheme boundary and will potentially be lost as a direct impact during construction of the Proposed Scheme is not considered to be significant at any geographic scale.

The various KER habitat types affected and corresponding total areas which overlap with the Proposed Scheme boundary are summarised in Table 12.13. These calculations include all KER habitat areas within the Proposed Scheme boundary, as the possibility of areas within the Proposed Scheme boundary but outside of the footprint of the Proposed Scheme itself being affected by construction activities cannot be ruled out. KERs highlighted in blue will be subject to direct habitat loss as a result of the Proposed Scheme.

Habitat loss may also lead to habitat fragmentation (i.e. creating new divisions of existing habitat blocks and / or contributing to an existing trend of fragmenting semi-natural habitat blocks). However, considering the habitat

types to be lost, their extents and the surrounding habitats beyond the Proposed Scheme boundary, this potential impact will not result in a significant effect at any geographic scale.

The mitigation measures that have been designed to avoid or reduce the effects of direct impacts to habitats are outlined in Section 12.5.1.

Table 12.13: Extent of KER Habitat Loss Within the Proposed Scheme

Habitat Type	Extent of Permanent Habitat within the scheme that could potentially be lost	Extent of Temporary Habitat within the scheme that could potentially be lost
National Importance		
Tidal rivers (CW2) (corresponding to Annex I Estuaries [1130])	No habitat loss	No habitat loss
Canals (FW3)**	Approximately 554m ² (0.55ha) of Royal Canal	Approximately (0.035ha) of Royal Canal
Reed and large sedge swamp (FS1)**	Approximately 7.75m ² (0.0007ha) of Royal Canal	Approximately (0.0003ha) of Royal Canal
Local Importance (Higher Value)		
Depositing / lowland rivers (FW2)	No habitat loss	No habitat loss
(Mixed) broadleaved woodland (WD1)**	Approximately 1,402m ² (0.014ha)	No habitat loss
Scattered trees and parkland (WD5)*	Approximately 3,500m ² (0.35ha)	Approximately 2,700m ² (0.27ha)
Hedgerow (WL1)**	Approximately 4,260m ² (0.42ha)	No habitat loss
Treelines (WL2)	276 No. trees	N/A

KERs highlighted in blue will be subject to direct habitat loss as a result of the Proposed Scheme

*Extent of habitat removal refers to parkland only, tree loss is captured under Treeline (WL2) habitat code

**total area of habitat within Proposed Scheme boundary not all habitats will be lost

12.4.3.2.2 Habitat Degradation – Surface Water Quality

During construction, contaminated surface water runoff and / or an accidental spillage or pollution event into any surface water feature has the potential to have significant negative effects on water quality and consequently affect aquatic and wetland habitats in the baseline environment. The effects of frequent and / or prolonged pollution events have the potential to be extensive and far-reaching and could potentially have significant long-term effects. In a worst-case scenario, estuarine and coastal habitats downstream could also be affected.

It is considered unlikely that a pollution event of such a magnitude would occur during construction, or if it did occur, it would be temporary in nature. Nevertheless, a precautionary approach has been adopted in the assessment of the potential risk of impacts on water quality. Consequently, detailed mitigation measures are required to further minimise the risk of contaminated surface water runoff and / or an accidental spillage or a pollution event as a result of the Proposed Scheme having any perceptible effect on water quality during construction.

Works within and adjacent to the Royal Canal could potentially result in the disturbance of canal sediments and / or the suspended solids arising from the release of sub-surface sediment have the potential to enter the Royal Canal pNHA and travel downstream, potentially entering into the Liffey Estuary Upper. Similarly, proposed works along St. Mobhi Drive, Glasnevin Hill and R108 St. Mobhi Road, could all potentially result in the release of sediment, and other materials generated during construction to Claremont Stream (located along St. Mobhi Drive) or the River Tolka. Suspended solids and other materials generated during construction could also enter Bachelors Stream along the Finglas Section of the Proposed Scheme. Furthermore, there is potential surface water connectivity to the River Santry and a drainage ditch south of the grounds of Santry Lodge. If cement-based products used in the Construction Phase of the Proposed Scheme (i.e. concrete which is a highly corrosive and alkaline material) were released into these water bodies it may cause surface water degradation and damage to aquatic fauna. This has the potential to result in significant negative effects on water quality and consequently affect aquatic and wetland habitats in the receiving environment. In a worst-case scenario, coastal habitats downstream, in Dublin Bay, could also be affected.

Habitat degradation as a consequence of construction effects on surface water quality also has the potential to affect the conservation status of tidal rivers (CW2) / Annex I habitat Estuaries [1130], and therefore, has the potential to result in a Negative and Significant impact at a National scale in the case of the aquatic / wetland

Annex I habitats located within the Zol of the Proposed Scheme. The Liffey Estuary Upper is hydrologically connected to downstream European sites which may also be at risk of habitat degradation as a consequence of construction effects on surface water quality. Habitat degradation as a consequence of construction effects on surface water quality of Bachelors Stream, Claremont Stream, and drainage ditch habitat are likely to be Significant at the Local level, while impacts on the water quality of the River Tolka and the River Santry are likely to be Significant at the County level (FW2), given its significance within Fingal. Impacts to the surface water quality of the Royal Canal (FW3 and FS1) are expected to be Significant at the Local / National level, depending on the magnitude of the impact and considering the status of the Royal Canal as a pNHA and the connectivity it provides to downstream water bodies.

The mitigation measures that have been designed to avoid or reduce the potential impacts of the Proposed Scheme on surface water quality are presented in Section 12.5.1.

12.4.3.2.3 Habitat Degradation – Hydrological Regime

During construction, the potential for temporary disruption to local drainage systems and hydrological regimes have been assessed in relation to the Proposed Scheme. The works are not predicted to result any long-term effects that would give rise to a likely significant negative effect on any aquatic habitats (or species contained therein) through effects on the hydrological regime (for more detail refer to Chapter 13 (Water)). Construction works at the proposed Royal Canal pedestrian / cycle bridge may have a temporary effect on the local flow due to instream works and temporary narrowing and subsequent changes to the flood regime. None of the instream works are predicted to have any long-term effects that would give rise to a likely significant negative effect on any aquatic habitats or species through effects on the hydrological regime, as the drainage design principles ensure that there will be no net increase in the surface water flow discharged to these receptors (for more detail refer to Chapter 13 (Water)).

12.4.3.2.4 Habitat Degradation – Groundwater

Any effects on the existing hydrogeological baseline supporting wetland habitats has the potential to negatively affect habitat extent and distribution, and vegetation structure and composition. The potential effects upon the existing hydrogeological regime are not necessarily limited to habitats within the Proposed Scheme boundary but can be far-reaching, with significant negative long-term effects. As discussed in Chapter 14 (Land, Soils, Geology & Hydrogeology), the Proposed Scheme may involve the excavation of potentially contaminated ground, result in damage to the aquifer, or change the existing groundwater regime.

Groundwater dependent habitats were not identified in close proximity to the Proposed Scheme, therefore any potential impacts as a result of the Proposed Scheme arise with the interaction between groundwater and surface water.

As detailed in the Construction Environmental Management Plan (CEMP) for the Proposed Scheme (Appendix A5.1 in Volume 4 of the EIAR), specific controls / mitigation measures (i.e. pollution control plan) will be put in place to manage runoff and minimise pollution to receiving water bodies during the Construction Phase. There are no predicted impacts that could give rise to a likely significant negative impact on any aquatic habitats or species at any time scale (for more detail refer to Chapter 13 (Water)).

12.4.3.2.5 Habitat Degradation – Air Quality

As discussed in Chapter 7 (Air Quality), and also in Section 12.4.3.1.2.6 in respect of the Royal Canal, the Proposed Scheme has the potential to generate dust during construction works which could affect vegetation in habitat areas adjacent to the Proposed Scheme.

As discussed in Section 12.4.3.1.2.6, air quality modelling of NO_x concentrations, and deposition rates, were modelled for the Construction Phase at distances up to 200m from the Proposed Scheme (refer to Chapter 7 (Air Quality) for details). The results from the air quality modelling deem the Proposed Scheme overall Negative, Slight and Short Term. As such harmful effects on vegetation from these emissions are not likely at any geographic scale.

12.4.3.2.6 Habitat Degradation – Non-Native Invasive Plant Species

Planting, dispersing, or allowing / causing the dispersal, spread or growth of certain non-native plant species is controlled under Article 49 of the Birds and Habitats Regulations and refers to plant or animal species listed on the Third Schedule of the Birds and Habitats Regulations (see also Section 12.3.7).

The accidental spread of such non-native invasive plant species as a result of construction works has the potential to impact on terrestrial habitats, potentially affecting plant species composition, diversity and abundance over the long-term. This is not only confined to habitats within and immediately adjacent to the footprint of the Proposed Scheme but includes habitat areas along the network of proposed haul routes associated with the Proposed Scheme.

The effects of introducing such non-native invasive plant species to highly sensitive and ecologically important habitat areas (i.e. designated areas for nature conservation or areas of Annex I habitat) have the potential to result in a likely significant negative effect, at geographic scales ranging from Local to International. Five areas of non-native invasive plant species listed on the Third Schedule of the Birds and Habitats Regulations were identified along the Proposed Scheme. Four species were recorded including Japanese knotweed, Himalayan balsam, Giant hogweed and Nuttall's waterweed. The desk study revealed records for the following additional species in close proximity to the Proposed Scheme

- Brazilian giant-rhubarb;
- New Zealand pigmyweed;
- Three-cornered garlic; and
- Water fern.

The aquatic survey confirmed the presence of Nuttall's waterweed (and the delisted Canadian waterweed) from the Royal Canal near the location where the proposed Royal Canal pedestrian / cycle bridge is proposed to be built.

Mitigation measures have been designed to avoid this potential impact (see Section 12.5.1.2.6).

12.4.3.3 Rare and Protected Plant Species

12.4.3.3.1 Habitat Loss

No protected plant species listed on the FPO were recorded within or in close proximity to the Proposed Scheme during multidisciplinary surveys. The aquatic survey at the Royal Canal did note that although opposite-leaved pondweed *Groenlandia densa* was not recorded, its potential for occurrence at that location could not be ruled out by virtue of the conditions and distribution of the species elsewhere along the Royal Canal. The desk study revealed historical records for opposite-leaved pondweed in two locations in the wider vicinity of the Proposed Scheme, as well as a record for water-violet and records for two red-listed bryophyte species.

Opposite-leaved pondweed may lie dormant in sediments for many years until conditions become suitable for its regrowth. Therefore, there is potential for establishment in the footprint of the Proposed Scheme, and the potential for direct impacts on this species to occur as a consequence of the Proposed Scheme cannot be ruled out, resulting in a Negative, Significant and Permanent effect, likely at a Local geographical scale.

12.4.3.3.2 Habitat Degradation – Surface Water Quality

No protected plant species listed on the FPO were recorded within the Proposed Scheme during field surveys. However, the desk study returned historical records of opposite-leaved pondweed within the Royal Canal. This species may lie dormant in sediments for many years until conditions become suitable for regrowth. The Construction Phase of the Proposed Scheme, in the absence of mitigation, has the potential to result in impacts on the surface water quality of the Royal Canal, through contamination with construction related runoff or accidental spillages (i.e. runoff of sediment / accidental spillages of harmful substances such as hydrocarbons / cementitious materials, etc.). Impacts on the quality of surface water within the Royal Canal could affect the possible establishment of populations of opposite-leaved pondweed present in the vicinity of the Proposed Scheme.

In the absence of mitigation, habitat degradation of the Royal Canal as a consequence of Construction Phase impacts on surface water, and the potential knock-on impacts this could have on the protected species opposite-leaved pondweed, is likely to be Significant at the National level.

12.4.3.3.3 Habitat Degradation – Hydrological Regime

During the Construction Phase, the potential for temporary disruption to local drainage systems and hydrological regimes have been assessed in relation to the Proposed Scheme. This is not predicted to result in a likely significant negative effect on any aquatic habitats or species through effects on the hydrological regime, with the exception of the Royal Canal (for more detail refer to Chapter 13 (Water)). The provision of the lowering of the Royal Canal water levels to enable working in the dry for the extent of instream works at the proposed pedestrian / cycle bridge, is not predicted to result in a likely significant effect beyond the Local geographic scale due to its limited extent and the retention of a minimum of 0.5m of water within that stretch of the Royal Canal.

12.4.3.4 Mammals

12.4.3.4.1 Bats

12.4.3.4.1.1 Roost Loss

12.4.3.4.1.2 There are no confirmed bat roosts located within the footprint of the Proposed Scheme. However, the Proposed Scheme will result in the loss of five PRFs. The potential impact of the permanent loss of these trees is considered to be Significant at a Local geographic scale due to the relatively low number of bats likely to be utilising this PRF and the availability of other PRFs in the wider area. Habitat Loss as a Result of Fragmentation of Foraging / Commuting Habitat and Commuting Routes

Bats rely on suitable semi-natural habitats which support the insect prey upon which they feed. The Proposed Scheme will result in the loss of such habitats used for feeding by all bat species recorded in the study area. Suitable habitat for foraging and commuting bats within the footprint of the Proposed Scheme includes hedgerows and treelines, mixed broadleaved woodland, canal, rivers, areas of parkland and open grassland. The area of the habitats which will be lost as a result of the Proposed Scheme is provided in Table 12.13 and shown in the Landscape General Arrangement drawings (BCIDD-ROT-ENV_LA-0304_XX_00-DR-LL-9001) in Volume 3 of the EIAR. This is not deemed significant, considering their location (adjacent to existing artificially lit roads) and the quantity of suitable habitat, which will not be impacted, in the local vicinity.

In assessing the impacts of habitat loss as a result of fragmentation of foraging / commuting habitat on bat populations, consideration was given to a species Core Sustenance Zone (CSZ). A CSZ refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the 'resilience and conservation status' of the colony using the roost. Bat Surveys for Professional Ecologists: Good Practice Guidelines (Collins 2016) states that:

'With reference to planning and development the core sustenance zone is: The area surrounding the roost within which development work can be assumed to impact the commuting and foraging habitat of bats using the roost, in the absence of information on local foraging behaviour. This will highlight the need for species-specific survey techniques where necessary; and; The area within which mitigation measures should ensure no net reduction in the quality and availability of foraging habitat for the colony, in addition to mitigation measures shown to be necessary following ecological survey work'.

Notwithstanding the fact that there is evidence of bats foraging and commuting within the study area of the Proposed Scheme, particularly along the River Tolka in Glasnevin and over the Royal Canal in Phibsborough, and that all parts of the Proposed Scheme which contain suitable habitat are likely to be within the CSZ of at least one bat roost, and considering the type of works proposed (e.g. upgrading of existing infrastructure for the most part), there is limited potential for the Proposed Scheme to act as a barrier to flight paths for bat species.

The exception to this is the proposed Royal Canal pedestrian / cycle bridge over the Royal Canal in Phibsborough. The provision of the proposed Royal Canal pedestrian / cycle bridge, slightly downstream of the existing Cross Guns Bridge, will effectively result in the loss of the section of the Royal Canal between these two bridge

crossings, for foraging / commuting bats. This will be Significant at the Local level only, as impacts will be restricted to local bat populations.

The provision of the proposed Royal Canal pedestrian / cycle bridge will also result in the fragmentation of suitable foraging habitat (i.e. the Royal Canal), during construction. Fragmentation of feeding habitat has the potential to disturb normal bat behavioural patterns, and thus adversely affect the ability of local bat populations to persist and reproduce, impacting on their local distribution and / or abundance. The barrier effect can manifest itself as soon as the site clearance phase commences and the barrier itself is in the form of the cleared lands.

Removal of suitable habitat for foraging and / commuting bats within the footprint of the Proposed Scheme including the habitats, canals (FW3), reed and large sedge swamp (FS1), mixed broadleaved woodland (WD1) scattered trees and parkland (WD5), hedgerows (WL1), treelines (WL2) and scrub (WS1)) is as outlined in Section 12.4.3.3.1. Habitat removal is within a highly disturbed urban environment with low numbers of species records, and as such, is not deemed to provide significant contributions to the CSZ of roosts outside of the footprint of the Proposed Scheme. The effect of habitat fragmentation and barrier effects associated with the construction of the Proposed Scheme is therefore considered to be Significant at the Local level only.

12.4.3.4.1.3 Installation of Temporary Working and Construction Compound Lighting Causing Indirect Disturbance of Flight Patterns

Construction Compounds are proposed in the following six locations:

- Construction Compound B1: North-eastern corner of Santry Cross;
- Construction Compound B2: St. Mobhi Drive;
- Construction Compound B3: Constitution Hill / Catherine Lane North Junction;
- Construction Compound F1: Mellows Park near St. Margaret's Road Roundabout;
- Construction Compound F2: Finglas Road / Finglas Place Junction; and
- Construction Compound F3: Claremont Lawns (opposite Glasnevin Cemetery).

Security lighting will be installed in these Construction Compounds for the duration of construction, thereby increasing the level of artificial lighting in these areas. Artificial lighting within suitable habitat may result in avoidance behaviour by bats and could prevent bats from accessing foraging areas or roosts and / or result in bats taking more circuitous routes to get to foraging areas and hence potentially depleting energy reserves and abandonment of nearby roosts. Given the suburban setting of the proposed Construction Compounds, and limited foraging resources in the existing environment, bats in the area are not deemed to be present in high numbers and would be habituated to some level of artificial lighting. In the event that additional lighting at the Construction Compound is required, it will be cowed and positioned to reduce over spill. Considering the Construction Compound will be in place for approximately 24 months, any potential impact will be short-term, and therefore the effect of the additional lighting is considered to be Significant at a Local level only.

Construction works will typically be undertaken during normal daylight working hours, and therefore, the requirement for lighting to accommodate construction works during night-time, in areas where existing light levels are low, will be limited.

It is however recognised that some elements of night-time work will likely be required given the transport importance of this existing corridor (e.g. lane closures and resurfacing). The bulk of the existing road corridor is largely illuminated by regularly spaced lighting columns for much of its length, and therefore, the requirement for lighting to accommodate construction works during night-time will be limited in areas where existing light levels are low, and of short duration.

12.4.3.4.2 Badger

Multidisciplinary surveys did not confirm any badger setts or evidence of badger within the footprint of the Proposed Scheme. Based on the results of the desk study, badger are known to occur within 1km of the Proposed Scheme.

Although it cannot be predicted if badger will establish new setts within the Zol of the Proposed Scheme before construction works commence, it is a possibility, and this scenario has been taken into account in the mitigation strategy (refer to Section 12.5.1.4.2).

12.4.3.4.2.1 Loss of Foraging Habitat and Breeding / Rest Sites

There are no badger setts located within the Zol of the Proposed Scheme. Therefore, there is no potential for the permanent loss of any badger sett to occur.

Construction will result in the permanent loss of minor and disturbed sections of suitable foraging / commuting habitat for badgers (i.e. amenity grassland, scattered trees and parkland, dry meadows and grassy verges, scrub, mixed broadleaved woodland and treelines / hedgerows). In addition, the provision of Construction Compounds for the duration of the Construction Phase will result in the temporary loss of the scattered trees and parkland and amenity grassland, which could be used by commuting / foraging badgers.

Permanent habitat removal will be largely adjacent to pre-existing roads / paths and is limited to 2m linear sections of amenity grassland, existing hard surfaces, scattered trees and parkland and roadside treelines / hedgerows, within a highly disturbed urban environment. These areas of habitat removal are not likely to provide significant foraging habitat for the local badger population. Therefore, the Proposed Scheme is unlikely to affect the conservation status of the local badger population and will not result in a likely significant negative effect, at any geographic scale.

12.4.3.4.2.2 Disturbance / Displacement

In conjunction with any displacement effects associated with habitat loss, increased human presence and / or noise and vibration associated with construction works, the Proposed Scheme has the potential to displace badgers from both breeding / resting places and from foraging habitat located beyond the footprint of the Proposed Scheme.

Given badgers are nocturnal in habit, their displacement from foraging areas (outside of areas where foraging habitat will be lost as a result of the Proposed Scheme) is extremely unlikely to affect the local badger population and will not result in a likely significant negative effect, at any geographic scale. In addition, badgers residing within the wider study area are likely to be habituated to disturbance within the urban environment and therefore would be less sensitive to very localised, temporary increases in disturbance. Disturbance and displacement effects on badger may also be the result of increased artificial lighting during construction. Nocturnal mammals, such as badger, are likely to be disturbed by the introduction of artificial light into established breeding and foraging areas (Rich and Longcore 2005). Although the majority of the Proposed Scheme corridor is already lit artificially, the proposal may result in the introduction of additional artificial lighting to previously unlit or poorly lit areas.

It is likely that the proposed Construction Compounds will require security lighting for the duration of construction. The habitat area adjacent to the Construction Compounds comprises suitable foraging habitat for badger (e.g. amenity grassland). If high-intensity, non-directional security lighting (e.g., floodlighting) is installed in the proposed compound, light spill into adjacent areas could render these areas unsuitable for foraging badger.

Therefore, lighting associated with the Construction Phase of the Proposed Scheme could result in a negative effect on badgers, albeit temporary in nature and significant at the local level.

12.4.3.4.2.3 Mortality Risk

Site clearance works have the potential to result in the mortality of badger species. The potential for this impact to occur would be expected to be greater during the breeding season when juveniles venture out of the maternal sett or indeed when males leave the sett earlier on. Furthermore, the potential for direct mortality to badger would be greater in more vegetated areas, as opposed to disturbed ground / urban habitats, as these areas would offer more in terms of breeding / resting / foraging habitat for badger. Although no setts were located during the surveys and the potential for the establishment of new setts is limited by virtue of the existing transport corridors, there remains the risk that commuting / foraging badger might become entrapped in deep excavations, particularly in areas adjacent to open parkland and along watercourse corridors. Given the relatively low numbers that might be expected to be affected, and that these species are highly mobile, the risk of mortality due to site clearance and

or excavation is unlikely to result in a level of mortality that would affect the species' conservation status, and result in a significant negative effect, even at a local geographic scale.

However, on a precautionary basis, mitigation measures have been designed to protect badger from such impacts (see Section 12.5.1.2.2).

12.4.3.4.3 Otter

It is possible that otter will establish new holt or couch sites within the Zol of the Proposed Scheme before construction works commence, and this scenario has been taken into account in the mitigation strategy (refer to Section 12.5.1.4.3).

12.4.3.4.3.1 Loss of Breeding / Resting Sites

Based on the findings of the field surveys carried out, there were no otter breeding or resting places, holts or couch sites present within the Proposed Scheme boundary. Therefore, there will not be any loss of holt or couch sites as a result of construction works. There was no suitable habitat for breeding / resting sites identified during the multidisciplinary surveys. Therefore, the Proposed Scheme will not have a likely significant effect on the conservation status of otter, as there will be no loss of breeding / resting sites, and will not have a likely significant negative effect, at any geographic scale.

12.4.3.4.3.2 Loss / Fragmentation of Foraging / Commuting Habitat

Evidence of otter was not recorded within or in close proximity to the Proposed Scheme during the field surveys undertaken. However, based on the results of the desk study, otter are known to utilise the Royal Canal and River Tolka. Otter also frequently use the Liffey Estuary Upper for commuting and foraging purposes, with holts identified at Dublin Port (Macklin *et al.* 2019). In addition, there is potential for otter to utilise disused drainage pipes within the vicinity of the Proposed Scheme.

The provision of Construction Compounds for the duration of the Construction Phase is not expected to result in the temporary loss of any habitat used by otter, owing to the fact that the Construction Compound locations comprise habitats that are not suitable for otter.

The proposed Royal Canal pedestrian / cycle bridge crossing may result in the fragmentation of foraging / commuting habitat for local otters. The provision of this bridge, slightly downstream of the existing Cross Guns Bridge, will effectively result in the loss of the section of the Royal Canal between these two bridge crossings (approximately 78m), for foraging / commuting otters. However, otter is a very adaptable species, and it is highly likely that local otter will quickly become habituated to the presence of the new bridge, and any associated disturbance, such as any impacts on foraging / commuting otter here would not be significant at any geographic scale.

The scale of habitat loss, through fragmentation, is relatively small when compared to the availability of other suitable riparian habitats present in the wider environment of the surface water catchments crossed by the Proposed Scheme. Otter are known to routinely use highly modified habitats within culverts and beneath bridges. Habitat loss arising from the Proposed Scheme would not constitute a significant decline in the extent of available otter habitat and it is predicted that the construction of the proposed Royal Canal pedestrian / cycle bridge, including the intrusion of one abutment into the Royal Canal and localised loss of riparian bank, would not impact commuting otter as the structure will be relatively narrow and will not prevent otter from swimming underneath. Thus, it will not affect the local otter population's ability to maintain itself, even in the short-term.

There will be some loss of habitat within and set back from the watercourse for the construction of the proposed Royal Canal pedestrian / cycle bridge abutments, resulting in a localised reduction in the extent of width of foraging activity. It should not pose an impediment or barrier to movement of otter. Thus, habitat loss and fragmentation associated with the construction of the Proposed Scheme will not have a likely significant effect on the conservation status of otter and will not have a likely significant negative effect, at any geographic scale.

12.4.3.4.3.3 Habitat and Food Source Degradation – Water Quality

As discussed in Section 12.4.3.2.2, the Construction Phase of the Proposed Scheme could result in contamination of receiving water bodies. This could result in significant negative impacts on otter either directly (e.g. acute or sub-lethal toxicity from pollutants) or indirectly (e.g. affecting their food supply or supporting habitats).

Habitat degradation as a result of effects on surface water quality during Construction Phase has the potential to affect the species' conservation status and result in a likely Negative and Significant effect, at a Local geographic scale. This is in consideration of the temporary nature and scale of the proposed impact, the availability of suitable habitat for otter upstream of the proposed Royal Canal pedestrian / cycle bridge over the Royal Canal and the abundance of otter across the study area, as revealed in the results of the desk study.

Mitigation measures have been designed to protect water quality during construction (see Section 12.5.1.2.2).

12.4.3.4.3.4 Habitat Severance / Barrier Effect

Works proposed in the vicinity of surface water features (e.g. the proposed Royal Canal pedestrian / cycle bridge), could result in a localised barrier effect to local otter populations, at least for the duration of construction. The proposed Royal Canal pedestrian / cycle bridge will be clear-span in nature, although one abutment will be partially constructed within the Royal Canal itself, as well as effectively severing otter access along one bank of the Royal Canal and reducing the riparian corridor on the other bank. During construction, it is likely that the works involved will result in a barrier effect to local otters, at least temporarily.

However, given that otter are generally nocturnal in habitat and works will typically be carried out during normal daylight working hours, affected otters would be expected to habituate to the altered landscape and any resulting barrier effect would be for the duration of the construction works which are proposed to be in the region of 12 months for this section of the Proposed Scheme (see Section 12.4.3.4.3.5 on disturbance / displacement and the habituation of otters to disturbance).

The severance / barrier effect of construction works on otter could affect the local population, over the course of construction. Although it is not likely to affect the species conservation status, it will result in a Negative and Significant effect, at the Local geographic scale.

12.4.3.4.3.5 Disturbance / Displacement

No otter holts were identified during the surveys undertaken. The results of the desk study show that active otter holts are known to occur within the vicinity of the Proposed Scheme, along the River Tolka, Liffey Estuary Lower (in Dublin Port) and along Bachelors Stream, in the proximity of Mellows Park (Finglas). Given the suitable habitat present, it is also reasonable to assume that active otter holts are present along stretches of the Royal Canal. Increased human presence and / or noise and vibration associated with construction works within the footprint of the Proposed Scheme is unlikely to affect these holts. However, construction works associated with the Proposed Scheme have the potential to (at least temporarily) displace commuting or foraging otter. The proposed duration for this work in the vicinity of the Royal Canal will be approximately 12 months which will include the construction of the proposed Royal Canal pedestrian / cycle bridge. Piling activities for the structure are estimated to require two weeks of work.

Construction activities at the proposed Royal Canal pedestrian / cycle bridge will include construction of a footbridge over the Royal Canal and an underbridge. These construction activities will involve excavations and piling (estimated at two weeks). Noise and vibrations associated with the construction of the proposed Royal Canal pedestrian / cycle bridge, as well as construction works in close proximity to the River Tolka in Glasnevin and the Liffey Estuary Upper in proximity to Arran Quay, will have the potential to create disturbance and displacement within the vicinity of the works.

Noise and disturbance levels associated with these works are quantified, and given the nature of the works, it is predicted that there will be significant disturbance for mammals up to 300m from the Proposed Scheme. Active otter holts are currently outside of this Zol, so disturbance effects from the Proposed Scheme are not deemed to cause any displacement effects leading to the abandonment of holts.

As such, physical disturbance for mammals is estimated to reach a maximum of 150m from the Proposed Scheme. This is consistent with the guidance on impacts to otter (NRA 2006b). For active otter holts outside of this Zol, disturbance effects from the Proposed Scheme are not deemed to cause displacement effects leading to the abandonment of holts.

Otter are known to tolerate human disturbance under certain circumstances (Bailey and Rochford 2006; EA 2010; Irish Wildlife Trust 2012). There are numerous records of otter within the urban Dublin area, which suggests a relatively high level of habituation to human disturbance and noise by otter (Macklin *et al.* 2019). As construction works will typically be undertaken during normal daylight working hours and otter are generally nocturnal in habit, and given that otter can (in many circumstances) tolerate high levels of human presence and disturbance, displacement of otter from their habitat is extremely unlikely to affect the local otter population. Therefore, disturbance during construction is not likely to have a significant effect on the species' conservation status and will not result in a likely Negative and Significant effect, at any geographic scale.

Disturbance and displacement effects on otter may also be the result of increased artificial lighting during construction. Nocturnal mammals, such as otter, are likely to be disturbed by the introduction of artificial light into established breeding and foraging areas (Rich & Longcore 2005). Although the majority of the Proposed Scheme corridor is already artificially lit, the proposal may result in the introduction of artificial lighting to previously unlit areas (e.g. if works areas require security lighting for the duration of construction and for discrete elements of the construction along the Royal Canal). However, construction works in the vicinity of known otter locations (e.g. the Royal Canal and the River Tolka) will require additional lighting for night working. Any exceedance above street illumination levels, particularly if light spill onto a watercourse were to occur could result in a Negative, Significant and Temporary effect, likely at a Local geographical scale.

12.4.3.4.3.6 Mortality Risk

Site works have the potential to result in the mortality of otter species. The potential for this impact to occur would be expected to be greater during the breeding season when juveniles venture out and start to fend for themselves. Furthermore, the potential for direct mortality to otter would be greater in more vegetated areas, as opposed to disturbed ground / urban habitats, as these areas would offer more in terms of breeding / resting / foraging habitat for otter. Although no holts were located during the surveys and the potential for the establishment of new holts is limited by virtue of the existing transport corridors, there remains the risk that commuting / foraging otter might become entrapped in deep excavations such as unenclosed pile voids, particularly by the narrow corridor around the proposed Royal Canal pedestrian / cycle bridge. Given the relatively low numbers that might be expected to be affected, and that these species are highly mobile, the risk of mortality due to site clearance and or excavation is unlikely to result in a level of mortality that would affect the species' conservation status, and result in a Negative and Significant effect, even at a Local geographic scale.

However, on a precautionary basis, mitigation measures have been designed to protect otter from such impacts (see Section 12.5.1.2.2).

12.4.3.4.4 Marine Mammals

12.4.3.4.4.1 Habitat and Food Resource Degradation – Water Quality

As discussed in Section 12.4.3.2.2, the Construction Phase of the Proposed Scheme could result in contamination of receiving water bodies. This could result in significant negative impacts on marine mammals either directly (e.g. acute or sub-lethal toxicity from pollutants) or indirectly (e.g. affecting their food supply or supporting habitats).

During construction of the proposed Royal Canal pedestrian / cycle bridge, sediment may be released into the canal waters and be transported downstream to the Liffey Estuary Upper and Tolka Estuary. Cement based products used in the Construction Phase of the Proposed Scheme (i.e. concrete which is a highly corrosive and alkaline material), released into Liffey Estuary Upper connecting water bodies, may cause surface water degradation and damage to aquatic fauna. This has the potential to result in Negative and Significant effects on the local food supply.

Habitat degradation as a result of effects on surface water quality during construction has the potential to affect the species' conservation status and result in a likely Negative and Significant effect, at a Local geographic scale.

This is in consideration of the temporary nature and scale of the proposed effect and the availability of suitable habitat in Dublin Bay.

Mitigation measures have been designed to protect water quality during construction (see Section 12.5.1.2.2).

12.4.3.4.5 Other Mammals

No other protected mammal species were recorded during the multidisciplinary surveys carried out along the Proposed Scheme. However, based on the results of the desk study, several mammal species, protected under the Wildlife Acts, are known to occur in the wider environment, including pine marten, red squirrel, hedgehog, pygmy shrew and Irish hare.

12.4.3.4.5.1 Habitat Loss

The construction of the Proposed Scheme will result in the permanent loss of suitable habitat for small mammals located within the boundary of the Proposed Scheme. Given the relatively low numbers of individuals of each species that are likely to be affected (i.e. pine marten, red squirrel, hedgehog, pygmy shrew, Irish hare), and the abundance of alternative suitable habitat available locally, the effects of habitat loss associated with construction works are unlikely to affect the long-term viability of their local populations. Therefore, habitat loss is unlikely to affect the species' conservation status or result in a significant negative effect, at any geographic scale.

12.4.3.4.5.2 Mortality Risk

Site clearance works have the potential to result in the mortality of small mammal species. The potential for this impact to occur would be expected to be greater during the breeding season when juveniles would be present in nests, or in the case of hedgehog impacts may be greater during their hibernation period. Furthermore, the potential for direct mortality to small mammals would be greater in more vegetated areas, as opposed to disturbed ground / urban habitats, as these areas would offer more in terms of breeding / resting habitat for small mammal species. Given the urban setting of the Proposed Scheme, the relatively low numbers of individuals of each species that are likely to be affected, and that they are highly mobile species, site clearance is unlikely to result in a level of mortality that would affect the species' conservation status, and result in a significant negative effect, even at a local geographic scale.

12.4.3.4.5.3 Disturbance / Displacement

In conjunction with any displacement effects associated with habitat loss, increased human presence and / or noise and vibration associated with construction works, have the potential to displace mammals from both breeding / resting places and from foraging habitat. Mammals residing within the wider study area are likely to be habituated to disturbance within the urban environment.

As construction works in areas of suitable foraging habitat will typically be undertaken during normal daylight working hours and the relevant mammal species are nocturnal in habit, displacement of mammal species from foraging areas (outside of areas where foraging habitat will be lost as a result of the Proposed Scheme) is extremely unlikely to affect the local mammal population and will not result in a likely significant negative effect, at any geographic scale.

12.4.3.5 Birds

12.4.3.5.1 Breeding Birds

The assessment carried out in the AA Screening and NIS for the Proposed Scheme (standalone documents provided within the planning application) considered the potential for the Proposed Scheme to affect the bird species listed as SCIs of SPA sites within the vicinity of the Proposed Scheme. That assessment concluded that the Proposed Scheme would not affect their breeding colonies or have any long-term effects on the local breeding populations. Therefore, for these species, the Proposed Scheme will not affect the conservation status of the breeding populations and will not result in a significant negative effect on the integrity of the European sites.

12.4.3.5.1.1 Habitat Loss and Loss of Breeding / Resting Sites

The Proposed Scheme will result in the loss of breeding bird nesting and foraging habitat within the footprint of the Proposed Scheme. The areas of habitat loss within the Proposed Scheme boundary are provided in Section 12.4.3.2, tabulated in Table 12.13 for all KER habitat types and shown in the Landscaping General Arrangement drawings (BCIDD-ROT-ENV_LA-0304_XX_00-DR-LL-9001) in Volume 3 of this EIAR. These areas comprise hedgerows and treelines, scattered trees and parkland habitats, and canal bank habitat (reed and large sedge swamp and grassland vegetation). In addition, there are areas of scrub, ornamental / non-native shrub, amenity grassland and dry meadows and grassy verges habitats (approximately 2.15ha in total area) within the footprint of the Proposed Scheme, which are not KERs in their own right due to their limited botanical value but may, however, provide nesting and / or foraging habitat for birds. These areas will be removed during construction of the Proposed Scheme resulting in an additional loss of breeding bird nesting and / or foraging habitat. In summary, the habitats that may be lost comprise:

- Treeline habitat located along R108 St. Mobhi Road in Glasnevin;
- Treeline habitat along R108 Botanic Road in Glasnevin;
- Reed and large sedge swamp and dry meadows and grassy verges habitat along the Royal Canal in Phibsborough;
- Scattered trees and parkland along the Royal Canal Bank, at its junction with R101 North Circular Road, to accommodate the proposed North Circular Road Underpass;
- Treeline habitat along R108 Constitution Hill;
- Scattered trees and parkland along R135 Finglas Road near Claremont Lawns; and
- Portions of existing treeline habitat in the central median along R135 Finglas Road.

The primary consequence of habitat loss will be increased competition for resources (i.e. nesting habitat and / or prey / food sources) both between and amongst breeding bird species. The magnitude of this effect will be largely defined by whether the local habitat resource has currently reached its carrying capacity or not in terms of breeding bird species. For species with larger home ranges during the breeding season, habitat loss at the scale of the Proposed Scheme is not likely to have any perceptible effects on breeding success or population dynamics. As the Proposed Scheme will be constructed within an already busy transport corridor, habitats suitable to support breeding birds are limited. Treelines and hedgerows are highly disturbed, and largely within the road median, and therefore do not offer significant shelter for breeding bird species.

The habitat areas that will be lost as a result of the Proposed Scheme form a relatively small part of larger expanses of similar habitat types and mosaics in the wider locality. Parks and greenspaces form a vital resource for breeding birds within an urban setting. These areas of suitable breeding bird nesting and / or foraging habitat available in the wider locality of the Proposed Scheme (i.e. from approximately 300m to 2km from these existing sites located within the footprint of the Proposed Scheme) include:

- Parks and green spaces with hedgerow, treeline and / or scrub boundaries such as the National Botanic Gardens, Griffith Park, Albert College Park; Home Farm Football Club playing pitches; and DCU playing pitches;
- Wildfowl and Waterbird habitat within the Liffey Estuary Upper and wider Dublin Bay area such as Tolka Estuary, Bull Island, Booterstown Marsh and Sandymount Strand; and
- Sections of the Royal Canal both upstream and downstream of the Proposed Scheme.

The proposed Royal Canal pedestrian / cycle bridge will require the permanent removal of potential nesting habitat for mute swans, and other riparian bird species, which are known to breed in the vicinity of Cross Guns Bridge. Suitable habitats include areas of reed and large sedge swamp and bankside grassland vegetation. The area subject to direct habitat loss (i.e. approximately 7.75m² in total area) forms a relatively small part of larger expanses of similar habitat types found along sections of the Royal Canal both upstream and downstream of the proposed Royal Canal pedestrian / cycle bridge.

None of the habitat areas to be lost are unique to the locality and, either individually or collectively, are not likely to support a significant proportion, or the only population of any given breeding bird species locally. Although a temporary decline in overall breeding bird abundance could potentially occur at a very local level (i.e. within the footprint of the Proposed Scheme), this is unlikely to affect the local range of the breeding bird species present

nor is it likely to affect the ability of these breeding bird populations to maintain their local populations in the long-term.

Mitigation measures will be implemented to reduce the effects of habitat loss on general breeding bird species locally (see Section 12.5.1.5.1.1).

12.4.3.5.1.2 Mortality Risk

If site clearance works were to be undertaken during the breeding bird season (i.e. March to August, inclusive) it is likely that nest sites holding eggs or chicks will be destroyed and birds killed.

Mortality of birds at the scale of the Proposed Scheme (excluding the proposed Royal Canal pedestrian / cycle bridge), over what is likely to be a single breeding bird season in terms of completing site clearance works, will probably have a short-term effect on local breeding bird population abundance. If the Construction Phase for the proposed Royal Canal pedestrian / cycle bridge were to be undertaken during the breeding bird season (i.e. March to August, inclusive) it is likely that nest sites holding eggs or chicks will be destroyed and birds killed. Mortality of birds may result in a short-term impact on mute swan and other riparian bird species, assuming construction of the proposed Royal Canal pedestrian / cycle bridge occurs over only one breeding bird season, as indicated in Chapter 5 (Construction).

However, in the longer-term this would be unlikely to affect the ranges of the breeding bird species recorded in the study area, nor would it be likely to affect the long-term viability of the local populations. Mortality of birds during site clearance works is not predicted to significantly affect the conservation status of any of the breeding bird species present within the study area at any geographic scale.

12.4.3.5.1.3 Disturbance / Displacement

The noise, vibration, increased human presence and the visual deterrent of construction traffic associated with site clearance and construction will temporarily disturb breeding bird species and is likely to displace breeding birds from habitat areas adjacent to the footprint of the Proposed Scheme. Construction activities will largely involve carriageway and pavement resurfacing / reconstruction, as required, readjustment of kerbs and new road layouts. However, there is an existing relatively high level of human disturbance within the immediate environment of the Proposed Scheme (i.e. along R108 Ballymun Road, R135 Finglas Road and in the City Centre area), and as such, it is likely that breeding species present are habituated to a certain degree of disturbance. The magnitude of the impact will be dependent on the type of construction works and their duration. General construction activities will have a less pronounced affect than blasting or piling, in terms of its Zol, but will be on-going from periods of 10 to 12 months for overall construction but reduced for operations such as piling or bulk demolition / excavations at the Royal Canal, North Circular Road Underpass and the Home Farm Football Club Retaining Wall, and over one breeding season. The Construction Phase of the Proposed Scheme will be completed, over a period of 24 months with individual elements being constructed on a phased basis as outlined in Chapter 5 (Construction).

Construction activities at the proposed Royal Canal pedestrian / cycle bridge will include excavation, piling and general construction activities over a period of 12 months. These activities will result in a greater magnitude of effect on the receiving environment. As a result, noise and vibration from piling and other construction works at the proposed Royal Canal pedestrian / cycle bridge, will have the potential to result in the reduced breeding success of all bird species breeding in the vicinity of the works. In terms of nesting sites, the most sensitive in terms of disturbance effects (given their conservation status and proximity of nest sites to the construction works) are mute swan. Breeding pairs will be temporarily displaced during the construction works. The area over which disturbance / displacement effects will occur, form a relatively small part of larger expanses of similar habitat types in the wider locality of the Royal Canal (i.e. both upstream and downstream sections of the Royal Canal). As such, given the availability of suitable habitat in the wider locality of the Proposed Scheme, the construction works are therefore not likely to affect the conservation status of breeding mute swan and will not result in a likely significant negative effect, at any geographic scale.

Although it is not possible to quantify the magnitude of this potential impact (or the potential effect zone), it could potentially extend for several hundred metres from the Proposed Scheme. Given the temporary to short-term nature of the construction works, disturbance or displacement effects will also be over the short-term with suitable habitat available in the wider locality of the Proposed Scheme. As such, the construction works are therefore not

likely to affect the conservation status of affected breeding bird species and will not result in a likely significant negative effect, at any geographic scale.

12.4.3.5.1.4 Habitat Degradation – Surface Water Quality

As discussed in Section 12.4.3.2.2, the Construction Phase of the Proposed Scheme could potentially result in contamination of receiving water bodies, with a consequent effect on breeding birds either directly (e.g. acute or sub-lethal toxicity from pollutants) or indirectly (e.g. affecting their food supply or supporting habitats).

During the Construction Phase, suspended solids, silt and other harmful materials generated as a result of proposed works could be released into the local drainage infrastructure and travel downstream, including, potentially, into the River Tolka, Royal Canal, Tolka Estuary or Liffey Estuary Lower. Cement based products used in the Construction Phase of the Proposed Scheme (e.g. concrete and / or bentonite which are highly corrosive and alkaline materials), if released into any of the above-mentioned water bodies, may cause surface water degradation and damage to aquatic fauna. This has the potential to result in Negative and Significant effects on water quality and could consequently affect aquatic and wetland habitats in the receiving environment. In a worst-case scenario, estuarine / coastal foraging habitats downstream could also be affected.

Habitat degradation as a result of effects on surface water quality during construction has the potential to affect the species' conservation status and result in a likely Negative and Significant effect, at a Local geographic scale.

Mitigation measures have been designed to protect water quality during construction (see Section 12.5.1.2.2).

12.4.3.5.2 Wintering Birds

This Section of the impact assessment deals with wintering bird species (i.e. those bird species which are SCIs of SPAs for their wintering populations or are listed on either the BoCCI Red or Amber lists for their wintering populations). The assessment carried out in the NIS for the Proposed Scheme considered the potential for the Proposed Scheme to affect the bird species listed as SCIs of Malahide Estuary SPA, Baldoyle Bay SPA, North Bull Island SPA, South Dublin Bay and River Tolka SPA, Rogerstown Estuary SPA, Skerries Islands SPA, Ireland's Eye SPA, Lambay Island SPA and The Murrough SPA, and their wintering populations. That assessment concluded that the Proposed Scheme would not affect their wintering bird colonies or have any long-term effects on the local wintering populations. Therefore, for these species, the Proposed Scheme will not affect the conservation status of the wintering bird populations and will not result in a significant adverse effect on the integrity of the European sites.

12.4.3.5.2.1 Habitat Loss

There will be no direct loss of feeding habitat to accommodate the Proposed Scheme. However, temporary and / or permanent increases in noise, vibration and / or human activity levels during construction of the Proposed Scheme could result in disturbance to and / or displacement of wintering bird species present within the footprint and / or the vicinity of the Proposed Scheme (see Section 12.4.3.5.2.2).

12.4.3.5.2.2 Disturbance / Displacement

A temporary and / or permanent increase in noise, vibration and / or human activity levels during the construction of the Proposed Scheme could result in disturbance to and / or displacement of wintering bird species present within the footprint and / or the vicinity of the Proposed Scheme. Landscaping proposals include the removal of a number of mature trees on R108 St. Mobhi Road, part of a substantial treeline, which currently provides screening to the playing pitches at Na Fianna GAA Club and Home Farm Football Club. The permanent removal of these trees will increase the visual and noise disturbance to foraging winter birds which use these pitches.

Assessment of construction related noise disturbance to wintering waterbirds is based on the research presented in Construction and Waterfowl: Defining Sensitivity, Response, Impacts and Guidance (Cutts *et al.* 2009) and Exploring Behavioural Responses of Shorebirds to Impulsive Noise (Wright *et al.* 2010). In terms of construction noise, levels below 50dB would not be expected to result in any response from foraging or roosting birds. Noise levels between 50dB and 70dB would provoke a moderate effect / level of response from birds (i.e. birds becoming alert and some behavioural changes (i.e. reduced feeding activity)), but birds would be expected to habituate to

noise levels within this range. Noise levels above 70dB would likely result in birds moving out of the affected zone or leaving the site altogether. At approximately 300m, typical noise levels associated with construction activity are generally below 60dB or, in most cases, are approaching the 50dB threshold (BSI 2008). As such, disturbance effects for general construction activities across the majority of the Proposed Scheme would not be expected to extend beyond a distance of approximately 300m, as noise levels associated with general construction activities would attenuate to close to background levels at that distance and beyond.

None of the construction activities (excluding the proposed Royal Canal pedestrian / cycle bridge) would be expected to result in any more than a moderate level of disturbance effect on wintering birds at distances beyond 75m. At 150m, noise levels are below 60dB or, in most cases, are approaching the 50dB threshold. Low, or no effects would be expected for those noise levels. Any landscape features, vegetation cover or buildings between the construction site and wintering bird sites would contribute to further reductions in the ambient noise at any given distance. Therefore, 300m is considered to be a precautionary buffer in defining the Zol of disturbance effects.

Construction activities at the proposed Royal Canal pedestrian / cycle bridge will include construction of a footbridge over the Royal Canal and an underbridge. These construction activities will involve excavations and piling and will result in a greater magnitude of effect on the receiving environment, albeit limited to 20m from the Proposed Scheme. As a result, noise and vibration from excavations and piling construction methodologies, will have the potential to result in increased levels of disturbance and displacement within the vicinity of the works, which in turn may reduce the suitability of existing foraging habitat for wintering bird species. Noise and disturbance levels as a result of bridge construction are quantified as 74dB at a distance of 20m, reducing to 60dB at 100m and 56dB at 150m, with the predicted noise impact being classified as ranging between Negative, Slight to Moderate and Temporary during the daytime period and Negative, Significant to Very Significant and Temporary during the evening and weekend periods, in the absence of noise mitigation. As such, disturbance for wintering birds is estimated to reach 200m from the Proposed Scheme.

As the majority of works will be carried out during normal working daylight hours, the potential for construction to disturb wintering birds at night, either foraging or roosting, will not arise. Impacts associated with increased levels of disturbance will likely result in the temporary displacement of these wintering bird species to other suitable available lands in the locality. These impacts will be associated with general construction activities (i.e. visual impact of construction workers and machinery and the associated vibration, and more constant / continuous noise levels) and impulse noise disturbance from infrequent noise sources with a high noise level, such as piling.

Following the completion of construction, disturbance levels will likely return to baseline conditions, and as a result, these lands will become available again as foraging and / or roosting habitat for these wintering bird species.

The majority of wintering birds identified in the desk study are typically found in coastal, estuarine and intertidal habitats including the Liffey Estuary and Dublin Bay, and therefore will not be impacted directly during construction. Protected bird species that are known to forage and / or roost at inland sites, such as amenity grassland and playing pitches within 300m of the Proposed Scheme include light-bellied Brent goose, curlew, oystercatcher, black-headed gull, herring gull, lesser black-backed gull, and Mediterranean gull. There are areas of suitable foraging, and / or roosting habitat for these species within the footprint of and adjacent to the Proposed Scheme (i.e. within the disturbance Zol), including the following sites, which have been returned from the desk study (Scott Cawley Ltd. 2017):

- Glasnevin / St. Vincent's Primary School (Major Importance), approximately 82m from the Proposed Scheme;
- Finglas / Erin's Isle GAA (Major Importance), approximately 85m from the Proposed Scheme;
- Glasnevin / DCU Sports Grounds (Major Importance), approximately 170m from the Proposed Scheme;
- Finglas / Dunsink Road (High Importance), approximately 207m from the Proposed Scheme;
- Tolka Valley Park (Moderate Importance), approximately 262m from the Proposed Scheme; and
- Finglas / Farnham Drive Park (High Importance), approximately 269m from the Proposed Scheme.

There are large areas of suitable foraging and / or roosting habitat available for these bird species in the wider locality of the Proposed Scheme, including those in closer proximity to nearby SPAs. These include other public

amenity grassland parks and sports pitches such as Beneavin de la Salle, Gael Scoil Uí Earcáin, Johnstown Park and St. Patrick's College in Drumcondra.

Wintering birds which are disturbed during construction will likely be displaced to suitable sites in the surrounding environment, such as those listed above, and therefore impacts are not considered to be significant beyond the local level. Therefore, in consideration of these factors, the loss of suitable foraging and / or roosting habitat within the Proposed Scheme boundary that is utilised by wintering birds and an increase in short-term disturbance or displacement effects will not affect the conservation status of any wintering bird species and will not result in a likely significant negative effect, at any geographic scale.

12.4.3.5.2.3 Habitat Degradation – Surface Water Quality

As discussed in Section 12.4.3.2.2, the Construction Phase of the Proposed Scheme could result in contamination of receiving water bodies. This could result in significant negative impacts on wintering birds either directly (e.g. acute or sub-lethal toxicity from pollutants) or indirectly (e.g. affecting their food supply or supporting habitats).

Habitat degradation as a result of effects on surface water quality during construction has the potential to affect the species' conservation status and result in a likely Negative and Significant effect, at a Local geographic scale.

Mitigation measures have been designed to protect water quality during construction (see Section 12.5.1.2.2).

12.4.3.6 Reptiles

There were no reptile species recorded during the multidisciplinary surveys and no suitable habitat confirmed within the footprint of the Proposed Scheme. The desk study did not return records for reptile species protected under the Wildlife Acts within the footprint of the Proposed Scheme or wider surrounding area. However, it cannot be ruled out that these species are not in the wider area due to the presence of suitable habitat.

12.4.3.6.1 Disturbance and Mortality Risk

Site clearance works have the potential to result in disturbance to, and the direct mortality of, common lizard. Given the relatively low area of potentially suitable habitat for common lizard in the wider study area, the number of individuals that would potentially be at risk is low and would be unlikely to affect the local populations in the long-term. Therefore, disturbance or mortality risk are not likely to affect the species' conservation status or result in a likely significant negative effect, at any geographic scale.

12.4.3.6.2 Habitat Severance / Barrier Effect

There is no potential for habitat severance / barrier effect as a result of the Proposed Scheme as there is no suitable habitat for reptile species within the footprint of the Proposed Scheme.

12.4.3.7 Amphibians

No amphibian species were recorded during the multidisciplinary surveys carried out along the Proposed Scheme. The desk study returned records for common frog and smooth newt within 1km of the Proposed Scheme, and therefore, it cannot be ruled out that these species occur in the vicinity of the Proposed Scheme.

12.4.3.7.1 Disturbance and Mortality Risk

Site clearance and / or construction works in areas within, or adjacent to, suitable amphibian habitat, have the potential to result in disturbance to, and the direct mortality of amphibians. Given the relatively small area of potentially suitable habitat for amphibians in the study area and its immediate locality, the number of individuals that would potentially be at risk is considered to be low. Therefore, potential impacts arising from increased disturbance or mortality risk are not likely to affect the local populations of any amphibian species in the long-term nor their conservation status and as such there is no potential for a likely Negative and Significant effect, above the Local geographic scale.

12.4.3.7.2 Habitat Severance / Barrier Effect

The temporary to short-term physical disruption of the existing landscape during site clearance and construction will fragment habitat used by amphibians. As a temporary to short-term impact, this is unlikely to present a significant barrier to the movement of the species such that it would affect the local amphibians population in the long-term. Therefore, habitat severance during construction and any associated barrier effect are not likely to affect the species' conservation status and are not predicted to result in a likely significant negative effect to amphibians, at any geographic scale.

12.4.3.7.3 Habitat Degradation – Surface Water Quality

As discussed in Section 12.4.3.2.2, the Construction Phase of the Proposed Scheme could result in contamination of receiving water bodies. This could result in significant negative impacts on amphibians either directly (e.g. acute or sub-lethal toxicity from pollutants) or indirectly (e.g. affecting their food supply or supporting habitats).

Habitat degradation as a result of effects on surface water quality during construction has the potential to affect the species' conservation status and result in a likely Negative and Significant effect, at a Local geographic scale. Mitigation measures have been designed to protect water quality during construction (see Section 12.5.1.2.2).

12.4.3.8 Fish

In general, no direct impacts are predicted to fish owing to the nature of the Proposed Scheme at watercourses including the fisheries-important River Tolka which is known to support populations of brown trout and provides a particularly important nursery function for salmonid species. However, instream works are proposed at the Royal Canal, which is known to support a range of coarse fish.

12.4.3.8.1 Habitat Loss / Severance and Barrier Effect

The results of the aquatic surveys undertaken by Triturus Environmental Ltd (2020), which were conducted along the Royal Canal between the 4th and 5th lock found that the canal offered excellent coarse fish habitat for a range of common species. The well-vegetated canal sections provide valuable nursery habitat for numerous fish species, in addition to good spawning substrate in the spring / early summer months. The canal substrate was also noted as suitable European eel habitat. The substrate was dominated by silt, with high clay fractions (often >0.3m in depth), with scattered boulder and localised marginal cobble / gravel areas.

The construction of one abutment for the proposed Royal Canal pedestrian / cycle bridge will result in the localised narrowing of the canal at this point with instream works. While it will not result in severance of passage, nor offer a barrier, it will represent a permanent loss of canal habitat for coarse fish and eel. This habitat loss would not constitute a significant decline in the extent of available habitat and will not affect the local fish population's ability to maintain itself, even in the short-term.

As such, the Proposed Scheme is not predicted to affect the conservation status of coarse fish populations (and by corollary nationally important eel if present) and therefore, will not result in a likely significant negative effect, at any geographic scale.

12.4.3.8.2 Habitat Degradation – Surface Water Quality

As discussed in Section 12.4.3.2.2, the Construction Phase of the Proposed Scheme could result in contamination of receiving water bodies. This could result in significant negative impacts on amphibians either directly (e.g. acute or sub-lethal toxicity from pollutants) or indirectly (e.g. affecting their food supply or supporting habitats).

The effects of frequent and / or prolonged pollution events in a river / canal system have the potential to be extensive and far-reaching and could potentially have significant long-term effects. It is considered unlikely that a pollution event of such a magnitude would occur during construction or if such an event did occur, it would be temporary in nature. Nevertheless, a precautionary approach is being taken in assuming a level of risk of water quality impacts and detailed mitigation measures are required to further minimise the risk of the Proposed Scheme having any perceptible effect on water quality during construction.

A range of coarse fish have been recorded from the Royal Canal and suitable substrates to support European eel. Habitat degradation as a result of effects on surface water quality during construction has the potential to affect the conservation status of coarse fish species and result in a likely Negative and Significant effect, at a Local geographic scale.

With regard to eel, habitat degradation as a result of effects on surface water quality during construction has the potential to affect the conservation status of the species and result in a likely Negative and Significant effect, at a National geographic scale.

Mitigation measures have been designed to protect water quality during construction (see Section 12.5.1.8.2).

12.4.3.8.3 Mortality Risk

During the construction of the proposed Royal Canal pedestrian / cycle bridge, there will be an increase in activity alongside and within the Royal Canal, until such time that the works area along one bank is separated from the remaining channel. This will include the localised lowering of the canal water levels. The risk of injury and mortality is considered low, as fish generally avoid areas where shadowing by humans etc. occurs, preferring to shelter in bankside vegetation as necessary.

In terms of eel, while suitable substrate was noted, there was no confirmation of presence, although their presence cannot be ruled out. Similar to coarse fish, however, the instream works could temporarily result in Significant injury / mortality effects at a National geographic scale for European eel and at a Local geographic scale for coarse species.

Mitigation measures have been designed to protect water quality during construction (see Section 12.5.1.8.2).

12.4.3.8.4 Disturbance / Displacement

Fish are sensitive to noise and vibration, and noisy construction activities in the water could cause avoidance reactions and possibly delay fish migration. These works include the construction of the proposed Royal Canal pedestrian / cycle bridge. There have been very few studies on the effects of anthropogenic sounds on the behaviour of wild fish, although a number of studies have investigated the response of caged fish to noise output, particularly relating to pile driving (Aquafact 2020). It has been demonstrated that Atlantic salmon and eel species are not sensitive to noise due to their mechanism of hearing, and it has been demonstrated that these species do not display avoidance behaviour in response to noise produced by piling.

Although wild fish may respond differently to noise compared to captured fish, it is probable that the construction of the proposed Royal Canal pedestrian / cycle bridge will have a minimal impact on the resident coarse fish within the Royal Canal. Additionally, the Construction Phase of this section of the Proposed Scheme including the Royal Canal pedestrian / cycle bridge is estimated at approximately 12 months, although key noise factors such as piling are estimated at being completed within two weeks. Thus, noise levels from construction operations and the presence of humans within or adjacent to the Royal Canal will increase noise levels in the short-term. However, in order to minimise any potential impacts on coarse fish, the design approach has been to minimise works directly in the canal, until such time that the channel is locally separated from the works area. Mitigation measures have been designed to limit the effects of noise on fish (see Section 12.5.1.8.4).

Disturbance / displacement during construction is not predicted to affect the conservation status of coarse fish populations (and by corollary nationally important eel if present) and therefore, will not result in a likely significant negative effect, at any geographic scale.

12.4.3.9 Invertebrates

The desk study did not return results for any rare / protected terrestrial invertebrate species within 1km of the Proposed Scheme. However, the Royal Canal supports a number of red-listed aquatic invertebrates, although none were recorded during surveys.

12.4.3.9.1 Habitat Loss

The desk study returned records for the glutinous snail *Myxas glutinosa* and the false orb pea mussel *Pisidium pseudosphaerium* along the Royal Canal, approximately 11km and 15km west (respectively) of the Proposed Scheme (see Appendix A12.1 in Volume 4 of this EIAR). These species are listed as 'Endangered' on the Ireland Red List No. 2: Non-Marine Molluscs (Byrne *et al.* 2009). Although these species were not recorded during field surveys, the potential for occurrence at that location could not be ruled out by virtue of the conditions and distribution of the species elsewhere along the Royal Canal.

Therefore, there is the potential for establishment in the footprint of the Proposed Scheme, and the potential for direct impacts on this species to occur as a consequence of the Proposed Scheme cannot be ruled out, resulting in a Negative, Significant and Permanent effect, likely at a Local geographical scale.

12.4.3.9.2 Habitat Degradation – Surface Water Quality

Based on the results of the desk study (see Section 12.3.13), the desk study found that glutinous snail *Myxas glutinosa* are known to occur along the Royal Canal, approximately 11km west (upstream) of the Proposed Scheme, with a live record identified at Collins Bridge, Lucan in 2003. Records were returned for false orb pea mussel *Pisidium pseudosphaerium* along the Royal Canal, approximately 15km west of the Proposed Scheme at Leixlip Station, Confey in 2003 (see Appendix A12.1 in Volume 4 of this EIAR). The desk study did not return records for freshwater molluscs within close proximity of the Proposed Scheme.

Notwithstanding this absence, habitat degradation, as a result of effects on surface water quality during construction, has the potential to result in a likely Significant effect at a Local level on these freshwater mollusc species, given their known presence upstream along the Royal Canal and their potential to occur within that section of the Royal Canal.

Mitigation measures have been designed to protect water quality during construction (see Section 12.5.1.2.2).

12.4.3.10 Summary of Potential Construction Phase Impacts

Table 12.14: Summary of Potential Construction Phase Impacts

Ecological Receptor	Ecological Valuation	Potential Impacts	Potential Significance
Designated Areas for Nature Conservation			
North Dublin Bay SAC; North Dublin Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the international to national geographic scale
South Dublin Bay SAC South Dublin Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the international to national geographic scale
Howth Head SAC Howth Head pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the international to national geographic scale
Rockabill to Dalkey Island SAC Dalkey Coastal Zone and Killiney Hill pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the international to national geographic scale
Lambay Island SAC Lambay Island pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the international to national geographic scale
South Dublin Bay and River Tolka Estuary SPA Dolphins, Dublin Docks pNHA Booterstown Marsh pNHA South Dublin Bay pNHA North Dublin Bay pNHA	International Importance National Importance National Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species) Disturbance / displacement	Likely significant effect at the international to national geographic scale

Ecological Receptor	Ecological Valuation	Potential Impacts	Potential Significance
Baldoyle Bay SPA Baldoyle Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology) Disturbance / displacement	Likely significant effect at the international to national geographic scale
North Bull Island SPA North Dublin Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species) Disturbance / displacement	Likely significant effect at the international to national geographic scale
Malahide Estuary SPA Malahide Estuary pNHA	International Importance National Importance	Habitat Degradation (hydrology) Disturbance / displacement	Likely significant effect at the international to national geographic scale
Ireland's Eye SPA Ireland's Eye pNHA	International Importance National Importance	Habitat Degradation (hydrology) Disturbance / displacement	Likely significant effect at the international to national geographic scale
Howth Head Coast SPA Howth Head pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the international to national geographic scale
Rogerstown Estuary SPA Portraine Shore pNHA Rogerstown pNHA	International Importance National Importance National Importance	Habitat Degradation (hydrology) Disturbance / displacement	Likely significant effect at the international to national geographic scale
Lambay Island SPA Lambay Island pNHA	International Importance National Importance	Habitat Degradation (hydrology) Disturbance / displacement	Likely significant effect at the international to national geographic scale
Dalkey Island SPA Dalkey Coastal Zone and Killiney Hill pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the international to national geographic scale
Skerries Islands SPA Skerries Islands NHA	International Importance National Importance	Habitat Degradation (hydrology) Disturbance / displacement	Likely significant effect at the international to national geographic scale
Rockabill SPA Rockabill Island pNHA	International Importance	Habitat Degradation (hydrology)	Likely significant effect at the international to national geographic scale
The Murrough SPA The Murrough pNHA	International Importance National Importance	Habitat Degradation (hydrology) Disturbance / displacement	Likely significant effect at the international to national geographic scale
The Royal Canal pNHA	National Importance	Habitat Loss and Fragmentation, Habitat Degradation (hydrology; hydrological regime; groundwater; non-native invasive plant species; air quality)	Likely significant negative effect at the local geographic scale Likely significant effect at the national geographic scale
Habitats (outside of designated areas for nature conservation)			
Tidal rivers (CW2)	National Importance	Habitat degradation (Surface Water Quality; non-native invasive plant species)	Likely significant effect at the national geographic scale
Depositing/lowland rivers (FW2)	Local Importance (Higher Value)	Habitat degradation (Surface Water Quality; non-native invasive plant species)	Likely significant effect at the local – county geographic scale, depending on the watercourse in question
Canal (FW3)	National Importance	Habitat Loss and fragmentation; Habitat degradation (Surface Water Quality; non-native invasive plant species) Habitat degradation (Hydrological Regime; Groundwater; air quality)	Likely significant effect at the national geographic scale Not Likely to be significant at any geographic scale
Large Reed and Sedge Swamp (FS1)	National Importance	Habitat Loss and fragmentation; Habitat degradation (Surface Water Quality; non-native invasive plant species)	Likely significant effect at the national geographic scale

Ecological Receptor	Ecological Valuation	Potential Impacts	Potential Significance
		Habitat degradation (Hydrological Regime; Groundwater; air quality)	Not Likely to be significant at any geographic scale
(Mixed) broadleaved woodland (WD1)	Local Importance (Higher Value)	Habitat Loss and Fragmentation, Habitat Degradation (non-native invasive plant species)	Likely significant effect at the local geographic scale
Scattered trees and parkland (WD5)	Local Importance (Higher Value)	Habitat Loss and Fragmentation, Habitat Degradation (non-native invasive plant species)	Likely significant effect at the local geographic scale
Hedgerows (WL1)	Local Importance (Higher Value)	Habitat Loss and Fragmentation, Habitat Degradation (non-native invasive plant species)	Likely significant effect at the local geographic scale
Treelines (WL2)	Local Importance (Higher Value)	Habitat Loss and Fragmentation, Habitat Degradation (non-native invasive plant species)	Likely significant effect at the local geographic scale
Rare / Protected Plant Species			
Opposite-leaved pondweed	National Importance	Habitat Loss, Habitat degradation (Surface Water Quality ; hydrological regime)	Likely significant effect at the local to national geographic scale
Fauna Species			
Bats	Local Importance (Higher Value)	Roost Loss, Habitat loss as a result of fragmentation of foraging / commuting habitat and commuting routes, Installation of temporary working and construction compound lighting causing indirect disturbance of flight patterns	Likely significant effect at the local geographic scale
Badger	Local Importance (Higher Value)	Disturbance / displacement (lighting)	Likely significant effect at the local geographic scale
Otter	County Importance	Habitat Severance / Barrier Effect, Habitat and Food Source Degradation– water quality, Disturbance / Displacement (lighting)	Likely significant effect at the local geographic scale
Marine mammals	International – County Importance	Habitat and Food Resource Degradation– Water Quality	Likely significant effect at the local geographic scale
Other mammal species protected under the Wildlife Acts	Local Importance (Higher Value)	Habitat Loss; Mortality Risk; Disturbance / Displacement	Not likely to be significant at any geographic scale
SCI bird species	International Importance	See SPAs above	See SPAs above
All other breeding bird species (non-SCI)	Local Importance (Higher Value)	Habitat Loss; Mortality risk; Disturbance / Displacement	No Likely significant effect at any geographic scale
		Habitat Degradation (hydrology)	Likely significant effect at the local geographic scale
All other wintering bird species (non-SCI)	Local Importance (Higher Value)	Disturbance / Displacement;	No Likely significant effect at any geographic scale
		Habitat Degradation (hydrology)	Likely significant effect at the local geographic scale
Reptiles	Local Importance (Higher Value)	Disturbance and Mortality Risk	Not likely to be significant at any geographic scale
Amphibians	Local Importance (Higher Value)	Disturbance and Mortality Risk ;Habitat Degradation (surface water quality)	Likely significant effect at the local geographic scale
Non-Annex fish species (e.g. Coarse fish, brown trout, European eel)	Local Importance (Higher Value) – National Importance	Habitat Degradation (surface water quality), Mortality Risk	Likely significant effect at the local- national geographic scale
Invertebrates (aquatic)	Local Importance (Higher Value)	Habitat Loss, Habitat Degradation (surface water quality) ;	Likely significant effect at the local geographic scale

12.4.4 Operational Phase

12.4.4.1 Designated Areas for Nature Conservation

12.4.4.1.1 European sites

12.4.4.1.1.1 Habitat Loss and Fragmentation

The potential for impacts on SCI bird populations for which SPAs are designated has been provided in the NIS.

Refer to Section 12.4.4.5 with regards to potential operational impacts on wintering bird species, which encompass all relevant SCI bird species.

12.4.4.1.1.2 Habitat Degradation / Effects on QI / SCI Species as a result of Hydrological Impacts

The Proposed Scheme is hydrologically connected to Dublin Bay via two main surface water receptors, the Tolka_050 and Tolka_060, as well as Ringsend WwTP (which ultimately discharges to Liffey Estuary Lower, Dublin Bay, post-treatment). The release of contaminated surface water runoff and / or an accidental spillage or pollution event into any surface water features during operation, has the potential to affect water quality in the receiving aquatic environment. Such a pollution event may include the release of sediment into receiving waters and the subsequent increase in suspended solids, and the accidental spillage and / or leaks of contaminants (i.e. fuel, oils, chemicals and concrete washings) into receiving waters. The associated effects of a reduction of surface water quality could potentially extend for a considerable distance downstream of the location of the accidental pollution event or the discharge point and therefore impact the downstream environment (i.e. Dublin Bay), within which European sites are located: North Dublin Bay SAC, South Dublin Bay SAC, Howth Head SAC, Rockabill to Dalkey Island SAC, North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA and Dalkey Islands SPA.

This reduction in water quality (either alone or in combination with other pressures on water quality) could result in the degradation of sensitive habitats present within these European sites, which in turn, would negatively affect the SCI bird species that rely upon these habitats as foraging and / or roosting habitat. It could also negatively affect the quantity and quality of prey available to SCI bird species. These potential impacts could occur to such a degree that the conservation objectives of the North Dublin Bay SAC, South Dublin Bay SAC, Howth Head SAC, Lambay Island SAC, Rockabill to Dalkey Island SAC, North Bull Island SPA, South Dublin Bay and River Tolka Estuary SPA, Howth Head Coast SPA, Dalkey Islands SPA, Baldoyle Bay SPA, Malahide Estuary SPA, Rogerstown Estuary SPA, Lambay Island SPA, Ireland's Eye SPA, Skerries Islands SPA, Rockabill SPA and The Murrough SPA are undermined.

12.4.4.1.1.3 Habitat Degradation as a Result of Introducing / Spreading Non-Native Invasive Species

Four non-native invasive plant species listed on the Third Schedule of the Birds and Habitats Regulations were present in five locations within, or in close proximity to the Proposed Scheme. In the absence of mitigation, there is potential for these species to spread or be introduced, during routine maintenance / management works, to terrestrial habitat areas in European sites downstream in Dublin Bay (i.e. North Dublin Bay SAC, South Dublin Bay SAC, North Bull Island SPA and South Dublin Bay and River Tolka Estuary SPA). These in turn may result in the degradation of the existing habitats and therefore undermine the conservation objectives of these European sites.

It is not considered likely that invasive species could spread to European sites which are located a significant distance from the outfall locations of the watercourses intersected by the Proposed Scheme, by virtue of the habitat conditions in which the species normally occurs and subject to the full implementation of the non-native Invasive Species Management Plan (ISMP) refer to Appendix A5.1 (CEMP) in Volume 4 of the EIAR. In addition, the maintenance of the Proposed Scheme does not have the potential to result in habitat degradation of the QI / SCI species of any European site as the result of operation impacts.

12.4.4.1.1.4 Disturbance / Displacement

There are no European sites within the disturbance Zol of the Proposed Scheme. No QI and / or SCI breeding / resting places were recorded within, or in close proximity to the Proposed Scheme during the surveys. However, non-designated QI species (i.e. otter, lampreys) are known to occur within the vicinity of the Proposed Scheme. Refer to Section 12.4.4.4 and Section 12.4.4.8 for more details with regards to potential impacts on QI mammals and fish, respectively.

The potential for impacts on SCI bird populations for which SPAs are designated has been provided in the NIS. Refer to Section 12.4.4.5 with regards to potential impacts on wintering bird species, which encompass all relevant SCI bird species.

12.4.4.1.2 NHAs and pNHAs

The potential impacts on European sites arising from the Proposed Scheme, outlined in Section 12.4.4.1.1, may also negatively affect the following NHA and / or pNHA sites, which are located within the boundaries of European sites and designated for similar reasons: Skerries Islands NHA, North Dublin Bay pNHA, Dolphins, Dublin Docks pNHA, and South Dublin Bay pNHA, Booterstown Marsh pNHA, Howth Head pNHA, Dalkey Coastal Zone and Killiney Hill pNHA, Lambay Island pNHA, Baldoye Bay pNHA, Malahide Estuary pNHA, Ireland's Eye pNHA, Portrairie Shore pNHA, Rogerstown pNHA, and The Murrough pNHA. The respective European sites are provided in Table 12.5. The Proposed Scheme also has the potential to affect biodiversity in a broader sense than only the QIs / SCIs of those European sites. Where biodiversity receptors in these pNHAs do not form part of the QIs / SCIs in the NIS assessment, they are considered under the other individual impact assessment headings for each KER below. Potential impacts arising from the Proposed Scheme on these NHA and / or pNHA sites would result in a likely Negative and Significant effect at a National geographic scale.

The assessment of potential impacts arising from the Proposed Scheme during its operation on the Royal Canal pNHA include habitat loss, degradation as a result of surface water quality effects, degradation as a result of air quality effects and the spread of non-native invasive species (see Section 12.4.4.4), effects on rare and protected plant species (see Section 12.4.4.5), and negative effects on the protected fauna species associated with these sites such as bats, otter and riparian birds (see Section 12.4.4.4.1, Section 12.4.4.4.3 and Section 12.4.4.5).

12.4.4.2 Habitats

12.4.4.2.1 Habitat Degradation – Surface Water Quality

Mitigation for the Operational Phase has been built into the design of the Proposed Scheme. The drainage system for the Proposed Scheme will discharge to Dublin Bay via two main surface water receptors, the Tolka_050 and Tolka_060, as well as Ringsend WwTP (which ultimately discharges to Liffey Estuary Lower, Dublin Bay, post-treatment). All drainage outfall discharges to surface waters represent point discharges. During the Operational Phase, the overall net increase in impermeable area for the road corridor will be approximately 2,400m² ultimately discharging to Dublin Bay. This increase in impermeable area will be being managed for the Proposed Scheme through a combination of bioretention areas, permeable paving and oversized pipes. Where no new paved areas are proposed, the existing drainage network will be retained (See Chapter 4 (Proposed Scheme Description)) for more detail on drainage design).

The inclusion of sustainable drainage systems (SUDs) will reduce the volume of surface water runoff discharging to the existing drainage network. The functioning and effectiveness of both elements of the road drainage network are discussed in more detail in Chapter 13 (Water). The Proposed Scheme will not exacerbate the existing surface water quality conditions in the Tolka_050, Tolka_060, or larger water bodies such as Liffey Estuary Upper, Liffey Estuary Lower and Dublin Bay. It will, in fact, result in a beneficial, albeit imperceptible, impact on the local surface water quality due to the implementation of SUDs, where appropriate.

Without the incorporation of the above design mitigation, then during operation, contaminated surface water runoff and / or an accidental spillage or pollution event into any surface water feature has the potential to have significant negative effects on water quality and consequently affect aquatic and wetland habitats in the receiving environment. The effects of frequent and / or prolonged pollution events have the potential to be extensive and far-reaching and could potentially have significant long-term effects. In a worst-case scenario, the downstream

habitats of the Liffey Estuary Lower and other transitional water bodies, and Dublin Bay coastal water body could also be affected. This is deemed to be Significant at a Local scale.

Mitigation measures to maintain SUDS are provided in Section 12.5.2.1.2.2.

12.4.4.2.2 Habitat Degradation – Non-Native Invasive Plant Species

Four non-native invasive plant species, as listed on the Third Schedule of the Birds and Habitats Regulations were identified during multidisciplinary terrestrial surveys within the Proposed Scheme boundary (see Table 12.7). The desk study revealed records from several non-native invasive species within 1km of the Proposed Scheme. In the absence of mitigation, there is potential for routine maintenance works to inadvertently spread contaminated vegetation cuttings both within the Proposed Scheme boundary, and within the immediate vicinity.

The effects of introducing such non-native invasive plant species to highly sensitive and ecologically important habitat areas (i.e. designated areas for nature conservation or areas of Annex I habitat) has the potential to result in a Negative and Significant effect at geographic scales ranging from Local to International.

Mitigation measures have been designed into the Construction Phase which carry on into the Operational Phase to avoid this potential impact (see Section 12.5).

12.4.4.2.3 Habitat Degradation – Air Quality

The existing transport corridor is minimised largely by non-sensitive habitats or man-managed habitats. In terms of the habitats within the Zol of the Operational Phase of the Proposed Scheme, it is not considered likely that any habitat degradation arising from air quality impacts to the habitats will occur.

12.4.4.3 Rare and Protected Plant Species

12.4.4.3.1 Habitat Degradation – Surface Water Quality

No protected plant species listed on the FPO were recorded within the Proposed Scheme during field surveys. However, the desk study returned historical records of opposite-leaved pondweed within the Royal Canal and the findings of the aquatic survey considered it likely that this species could be present at the location of the Royal Canal pedestrian / cycle bridge. This species may lie dormant in sediments for many years until conditions become suitable for regrowth.

Surface water runoff from the Proposed Scheme will discharge into the Royal Canal, via Cross Guns Bridge and the proposed Royal Canal pedestrian / cycle bridge. The effects of habitat degradation as a result of impacts to surface water quality during operation are not considered to be significant at any geographic scale. The Proposed Scheme will not exacerbate the existing surface water quality conditions. It will, in fact, result in a positive impact on surface water quality at this location due to the inclusion of SUDS, where appropriate. SUDS measures will reduce the volume of surface water runoff and concentrations of harmful compounds, such as hydrocarbons, HMs and PM that would be derived from the internal combustion engines of vehicles using the route, being discharged into receiving water bodies. Therefore, the effect of habitat degradation is not likely to be significant at any geographic scale, and it can be concluded that there is no potential for the operation of the Proposed Scheme to result in any significant effects on rare and protected plant species.

12.4.4.3.2 Habitat Loss / Fragmentation

No protected plant species listed on the FPO were recorded within the Proposed Scheme during field surveys. However, the desk study returned historical records of opposite-leaved pondweed within the Royal Canal and the findings of the aquatic survey considered it likely that this species could be present at the location of the Royal Canal pedestrian / cycle bridge. This species may lie dormant in sediments for many years until conditions become suitable for regrowth.

In the event that opposite-leaved pondweed *Groenlandia densa* is reported confirmed within the works area, and is located within land that is required to be altered / used during construction, then mitigation measures highlighted in Section 12.5.2.3.1 will be required.

12.4.4.4 Mammals

12.4.4.4.1 Bats

12.4.4.4.1.1 Indirect Disturbance of Flight Patterns Due to Operational Phase Lighting

Bat activity was recorded at all four locations surveyed, Mellows Park (CBC0304BT001), along R108 Ballymun Road at Albert College Park (CBC0304BT002), over the River Tolka at Dean Swift Bridge along R108 St. Mobhi Road in Glasnevin (CBC0304BT003), and over the Royal Canal at Cross Guns Bridge in Phibsborough (CBC0304BT004). Additional permanent lighting features within suitable habitat may result in avoidance behaviour by bats. Such displacement (which would be a matter of metres) could prevent bats from accessing foraging areas or roosts and / or result in bats taking more circuitous routes to get to foraging areas and hence potentially depleting energy reserves and abandonment of nearby roosts. Given the urban / suburban environment of the Proposed Scheme, and the fact that artificial lighting is already present along the footprint of the Proposed Scheme, the effects of displacement as a result of increased artificial lighting are not considered to be significant at any geographic scale. The lighting approach involves the use and upgrade of existing lighting infrastructure and given that artificial lighting is already in place along the Proposed Scheme, bat species who utilise the area would already be habituated to some level of artificial lighting. The exception to this is the area of the River Tolka to the south of St. Mobhi Drive. Here, additional lighting is proposed along the amenity grassland area to the south of St. Mobhi Drive, with proposed lighting here to be located closer to the River Tolka than existing lighting, which is located along the road itself. The additional lighting here could result in displacement effects on bats foraging along the river corridor through light spill. This impact would be considered Significant at the Local level only, given the discrete location over which effects in local bats would be felt.

The Proposed Scheme will not result in any additional lighting columns at Cross Guns Bridge along the Royal Canal. The proposed Royal Canal pedestrian/ cycle bridge here will require the installation of low lux level light-emitting diode (LED) lighting under the handrail of the proposed bridge. The lighting will be angled towards the walkway and directed away from the canal. This lighting is required for public health and safety reasons. Considering the existing levels of lighting in the area, which local bats are already habituated to, the addition of this highly directional, low level lighting, it is not anticipated to result in any significant effect on local bat populations or affect their ability to forage and commute in the area.

12.4.4.4.1.2 Disturbance / Displacement – Increased Human Activity

The provision of the proposed Royal Canal pedestrian / cycle bridge over the Royal Canal is likely to result in increased human presence in this area of the Royal Canal. However, populations of bats associated with the Royal Canal in the vicinity of the Proposed Scheme are likely to be habituated to a certain degree of human disturbance. Therefore, it is considered that there may be Significant and Temporary effects on bats at a Local scale, until such a time that they have habituated to the increased levels of human disturbance.

12.4.4.4.2 Badger

No evidence of badger was recorded along the Proposed Scheme during surveys undertaken. However, based on the results of the desk study, badger are known to occur within the wider vicinity, and therefore, impacts on this species cannot be excluded.

12.4.4.4.2.1 Habitat Severance / Barrier Effect

Barriers such as road infrastructure may affect foraging behaviour and dispersal corridors (i.e. the movement of species between breeding, foraging and hibernation sites), meaning that local populations can become isolated, having long-term effects on genetic diversity and gene flow, at a Local geographic scale.

As the Proposed Scheme, for the most part, will consist of upgrading existing infrastructure, the effect of habitat severance / barrier effects on badger is not considered to be significant at any geographic scale. The existing infrastructure itself acts as a barrier to badger movement across the landscape and the Proposed Scheme will neither exacerbate nor improve the barrier effect already in existence.

12.4.4.4.2.2 Mortality Risk

The Proposed Scheme will not result in any increase in terms of mortality risk to badger during operation. This is because the Proposed Scheme is largely focused on upgrading existing infrastructure, the mortality risk of which already exists. The Proposed Scheme will neither exacerbate nor improve the level of mortality risk associated with this infrastructure. Therefore, the impact of mortality risk to badger, as a result of the Proposed Scheme is not regarded to be significant at any geographic scale.

12.4.4.4.2.3 Light Spill

Nocturnal mammals, such as badger, are likely to be disturbed by the introduction of artificial light into established breeding and foraging areas (Rich and Longcore 2005). Although the majority of the Proposed Scheme corridor is already lit artificially, the proposal will result in the introduction of artificial lighting to previously unlit areas at an amenity grassland area to the south of St. Mobhi Drive, close to the River Tolka and at the Royal Canal crossing at the proposed Royal Canal pedestrian / cycle bridge.

The lighting design of the Proposed Scheme will control light emissions such that, along the majority of the alignment, light spill will not extend beyond the Proposed Scheme boundary, and where it will, it will be at tie-ins with the existing road network or at residential properties. There are no badger setts, or areas of high badger activity, within or in the immediate vicinity of the Proposed Scheme boundary that are located within the modelled light spill zone for the Proposed Scheme.

Therefore, lighting associated with the Proposed Scheme will not disturb or displace badgers from habitat areas located beyond the Proposed Scheme boundary. Thus, the Proposed Scheme will not affect the species conservation status in that regard and will not result in a likely Negative and Significant effect, at any geographic scale.

12.4.4.4.3 Otter

No evidence of otter was recorded along the Proposed Scheme during surveys undertaken. However, based on the results of the desk study and the evidence from the aquatic survey, otter are known to occur within the wider vicinity, particularly along the Royal Canal, the River Tolka and the Liffey Estuary Upper. Therefore, impacts on this species cannot be excluded.

12.4.4.4.3.1 Habitat Severance / Barrier Effect

Barriers such as road infrastructure may affect foraging behaviour and dispersal corridors (i.e. the movement of species between breeding, foraging and resting sites), meaning that local populations can become isolated, having long-term effects on genetic diversity and gene flow, at a Local geographic scale.

As the Proposed Scheme, for the most part, will consist of upgrading existing infrastructure, the effect of habitat severance / barrier effects on otter is not considered to be significant at any geographic scale. The existing infrastructure itself acts as a barrier to otter movement across the landscape and the Proposed Scheme will neither exacerbate nor improve the barrier effect already in existence. The proposed Royal Canal pedestrian / cycle bridge at the Royal Canal is the only proposed additional infrastructure relevant to otter, given its location on the Royal Canal. During operation, this proposed clear-span bridge will not result in any further habitat severance or a barrier effect to populations of local otter, which will still be able to utilise the aquatic environs surrounding the bridge for commuting and foraging purposes. Therefore, the impact of habitat severance / barrier effects on otter, as a result of the Proposed Scheme, is not considered to be significant at any geographic scale.

12.4.4.4.3.2 Disturbance / Displacement

The provision of the proposed Royal Canal pedestrian / cycle bridge over the Royal Canal is likely to result in increased human presence in this area of the Royal Canal. However, populations of otter associated with the Royal Canal in the vicinity of the Proposed Scheme are likely to be habituated to a certain degree of human disturbance. Therefore, it is considered that there may be Significant and Temporary effects on otter at a Local scale, until such a time that they have habituated to the increased levels of human disturbance.

Nocturnal mammals, such as the otter, would be likely to be disturbed by the introduction of artificial light into established breeding and foraging areas (Rich and Longcore 2005). Permanent lighting is proposed along all of the Proposed Scheme corridor. However, it should be noted that the majority of the Proposed Scheme corridor is already lit artificially, and so otter in the area would be habituated to some degree of artificial lighting. Previously unlit areas, which will be artificially lit as a result of the Proposed Scheme include an amenity grassland area to the south of St. Mobhi Drive, close to the River Tolka and at the Royal Canal crossing at the proposed Royal Canal pedestrian / cycle bridge. It is considered that there may be Significant and Temporary effects on otter at a Local scale, until such a time that they have habituated to the new levels of artificial lighting.

The Proposed Scheme will not result in any additional lighting columns at Cross Guns Bridge along the Royal Canal. The proposed Royal Canal pedestrian / cycle bridge here will require the installation of low lux level LED lighting under the handrail of the proposed bridge. The lighting will be angled towards the walkway and directed away from the canal. This lighting is required for public health and safety reasons. Considering the existing levels of lighting in the area, which the local otter population is already habituated to, the addition of this highly directional, low level lighting is not anticipated to result in any significant effect on the local otter populations.

Disturbance or displacement associated with the operation of the Proposed Scheme is not likely to affect the conservation status of otter and therefore, will not result in a likely long-term significant negative effect, at any geographic scale.

12.4.4.4.3.3 Habitat and Food Source Degradation – Surface Water Quality

As discussed in Section 12.4.4.2.1, without the design mitigation incorporated into the design of the Proposed Scheme, the Operational Phase of the Proposed Scheme could potentially result in contamination of receiving water bodies. This could result in significant negative impacts on otter either directly (e.g. acute or sub-lethal toxicity from pollutants) or indirectly (e.g. affecting their food supply or supporting habitats).

Habitat degradation as a result of effects on surface water quality during operation has the potential to affect the conservation status of otter and result in a likely significant negative effect, at a local geographic scale. This is in consideration of the temporary nature and scale of the proposed impact, the availability of suitable habitat for otter in the wider vicinity and the relative abundance of otter across the wider environment, as demonstrated in the results of the desk study.

12.4.4.4.3.4 Mortality Risk

The Proposed Scheme will not result in any increase in terms of mortality risk to otter during operation. This is because the Proposed Scheme is largely focused on upgrading existing infrastructure, the mortality risk of which already exists. The proposed Royal Canal pedestrian / cycle bridge at the Royal Canal is the only proposed additional infrastructure relevant to otter, given its location on the Royal Canal. This bridge may be accessible to otter. However, as it is a proposed pedestrian / cycle bridge, there is a negligible mortality risk associated with it. The Proposed Scheme will neither exacerbate nor improve the level of mortality risk associated with this infrastructure. Therefore, the impact of mortality risk to otter, as a result of the Proposed Scheme is not considered to be significant at any geographic scale.

12.4.4.4.4 Marine Mammals

12.4.4.4.4.1 Surface Water Quality and Prey Abundance

As discussed in Section 12.4.4.2.1, without the design mitigation incorporated into the design of the Proposed Scheme, the Operational Phase of the Proposed Scheme could result in contamination of receiving water bodies. This could result in significant negative impacts on marine mammals either directly (e.g., acute or sub-lethal toxicity from pollutants) or indirectly (e.g. affecting their food supply or supporting habitats).

Habitat degradation as a result of effects on surface water quality during operation has the potential to affect the conservation status of marine mammals and result in a likely Negative and Significant effect, at a Local geographic scale. This is in consideration of the temporary nature and scale of the proposed impact, the availability of suitable habitat for marine mammals in the wider vicinity and the relative abundance of marine mammals across the wider environment, as demonstrated in the results of the desk study.

12.4.4.4.5 Other Mammals

No evidence of other protected terrestrial mammals was recorded along the Proposed Scheme during surveys undertaken. However, based on the results of the desk study, other protected terrestrial mammals (see Section 12.3.8.5) are known to occur within the wider vicinity and therefore impacts on this species cannot be excluded.

12.4.4.4.5.1 Habitat Severance / Barrier Effect

Barriers such as road infrastructure may affect foraging behaviour and dispersal corridors (i.e. the movement of species between breeding, foraging and hibernation sites), meaning that local populations can become isolated, having long-term effects on genetic diversity and gene flow, at a Local geographic scale.

As the Proposed Scheme, for the most part, will consist of upgrading existing infrastructure, the effect of habitat severance / barrier effects on mammals is not considered to be significant at any geographic scale. The existing infrastructure itself acts as a barrier to mammal movement across the landscape and the Proposed Scheme will neither exacerbate nor improve the barrier effect already in existence.

12.4.4.4.5.2 Mortality Risk

The Proposed Scheme will not result in any increase in terms of mortality risk to mammals during operation. This is because the Proposed Scheme is largely focused on upgrading existing infrastructure, the mortality risk of which already exists. The Proposed Scheme will neither exacerbate nor improve the level of mortality risk associated with this infrastructure. Therefore, the impact of mortality risk to mammals, as a result of the Proposed Scheme is not regarded to be significant at any geographic scale.

12.4.4.4.5.3 Light Spill

Nocturnal mammals are likely to be disturbed by the introduction of artificial light into established breeding and foraging areas (Rich and Longcore 2005). Permanent lighting is proposed along all of the Proposed Scheme corridor. However, it should be noted that the majority of the Proposed Scheme corridor is already lit artificially, and so mammals in the area would be habituated to some degree of artificial lighting.

Previously unlit areas, which will be artificially lit as a result of the Proposed Scheme include an amenity grassland area to the south of St. Mobhi Drive, close to the River Tolka and at the Royal Canal crossing at the proposed Royal Canal pedestrian / cycle bridge. It is considered that there may be Significant and Temporary effects on mammals at a Local scale, until such a time that they have habituated to the new levels of artificial lighting.

12.4.4.5 Birds

12.4.4.5.1 Breeding Birds

12.4.4.5.1.1 Disturbance / Displacement

Increases in noise levels associated with the increased frequency of bus traffic, as well as increased human presence, owing to the provision of the proposed cycle tracks, may also have a negative effect on bird abundance and occurrence in the locality. Increased noise levels, as well as causing disturbance to birds in the locality, may also affect the breeding success of local bird populations as bird calls would become drowned out by traffic noise.

It is important to note that the majority of the Proposed Scheme is located within a highly urbanised environment, and so traffic noise is an existing source of disturbance for breeding birds in the vicinity. Owing to this, the population of breeding birds which occur here are likely to already be habituated to some level of noise disturbance and the effect of increased noise is not likely to be significant at any geographic scale.

Disturbance effects on breeding birds will most likely be of greater impact at the Royal Canal, than the remainder of the Proposed Scheme. The provision of the proposed Royal Canal pedestrian / cycle bridge over the Royal Canal is likely to result in increased human presence in this area of the Royal Canal. This is likely to result in the displacement of nesting riparian birds from the area immediately surrounding the proposed Royal Canal pedestrian / cycle bridge. The area of increased disturbance forms a relatively small part of larger expanses of

similar habitat along the Royal Canal. It is therefore considered that there may be Significant and Temporary effects on breeding riparian birds at a Local scale, until such a time that they have established new nesting sites.

The displacement of breeding birds from the Proposed Scheme boundary is likely to result in an increase in competition for resources (i.e. nesting habitat or prey / food sources) both between and amongst breeding bird species, which in turn would have negative impacts on local breeding bird populations in the long-term.

Although the Proposed Scheme is predicted to have a long-term effect on local breeding bird populations, even at a local level this is not predicted to affect the ability of local breeding bird species to persist within their current ranges or to maintain their populations long-term. Therefore, the Proposed Scheme is not likely to affect the conservation status of breeding bird species and will not result in a likely significant negative effect, at any geographic scale.

12.4.4.5.1.2 Habitat Degradation – Surface Water Quality

As discussed in Section 12.4.4.2.1, without the design mitigation incorporated into the design of the Proposed Scheme, the Operational Phase of the Proposed Scheme could result in contamination of receiving water bodies. In the absence of mitigation, this could potentially result in significant negative impacts on breeding birds either directly (e.g. acute or sub-lethal toxicity from pollutants) or indirectly (e.g. affecting their food supply or supporting habitats).

Habitat degradation as a result of effects on surface water quality during operation has the potential to affect the conservation status of breeding birds and result in a likely Negative and Significant effect, at a Local geographic scale. This is in consideration of the temporary nature and scale of the proposed impact, the availability of suitable habitat for breeding birds in the wider vicinity and the relative abundance of breeding birds across the wider environment, as demonstrated in the results of the desk study.

12.4.4.5.2 Wintering Birds

This Section of the impact assessment deals with wintering bird species (i.e. those bird species which are SCIs of SPAs for their wintering populations or are listed on either the BoCCI Red or Amber lists for their wintering populations).

12.4.4.5.2.1 Disturbance / Displacement

During operation, the Proposed Scheme has the potential to disturb and displace wintering bird species from their suitable habitat near the Proposed Scheme boundary due to an increase in noise, human activity and visual disturbance associated with increased human presence and increased bus flow. Although the operational disturbance / displacement effect cannot be quantified, it would be expected to be much less than the 300m ZoI associated with construction works because operational disturbance will be limited to vehicular traffic and periodic maintenance works, which are also present in the existing environment. Most species of wintering birds are likely to habituate to the increased traffic flows and human presence along cycle tracks etc. Any operational noise increases are not likely to alter the existing baseline effect on wintering birds using the habitats locally.

Although there is still likely to be some level of displacement effect, a perceptible effect might be expected to be limited to habitats immediately adjacent to the proposed Royal Canal pedestrian / cycle bridge crossing. Although it is likely to add to the effect of habitat loss for breeding species including moorhen and mute swan, in terms of additional habitat area unavailable or unlikely to be used by wintering birds, it is not predicted to have a detrimental population level effect.

Therefore, any displacement of wintering birds from habitat areas during the Operational Phase of the Proposed Scheme is not likely to affect the conservation status of wintering bird species and will not result in a likely significant negative effect, at any geographic scale.

12.4.4.5.2.2 Habitat Degradation – Surface Water Quality

As discussed in Section 12.4.4.2.1, without the design mitigation incorporated into the design of the Proposed Scheme, the Operational Phase of the Proposed Scheme could result in contamination of receiving water bodies.

This could result in significant negative impacts on wintering birds either directly (e.g. acute or sub-lethal toxicity from pollutants) or indirectly (e.g. affecting their food supply or supporting habitats).

Habitat degradation as a result of effects on surface water quality during operation has the potential to affect the conservation status of wintering birds and result in a likely Negative and Significant effect, at a Local geographic scale. This is in consideration of the temporary nature and scale of the proposed impact, the availability of suitable habitat for wintering birds in the wider vicinity and the relative abundance of wintering birds across the wider environment, as demonstrated in the results of the desk study.

12.4.4.6 Reptiles

No evidence of any protected reptile species, such as common lizard, was identified along the Proposed Scheme during the field surveys or the desk study undertaken. No suitable reptile habitat was identified within the study area during the surveys undertaken either. Nonetheless, a precautionary approach has been adopted which has not excluded the possibility of common lizard being present in the vicinity of the Proposed Scheme.

12.4.4.6.1 Habitat Severance / Barrier Effect

Barriers such as road infrastructure may affect foraging behaviour and dispersal corridors (e.g. the movement of species between breeding and hibernation sites), meaning that local populations can become isolated, having long-term effects on genetic diversity and gene flow, at a Local geographic scale.

As the Proposed Scheme, for the most part, consists of upgrading existing infrastructure, the effect of habitat severance / barrier effects on common lizard is not considered to be significant at any geographic scale. The existing infrastructure itself acts as a barrier to amphibian movement across the landscape and the Proposed Scheme will neither exacerbate nor improve the barrier effect already in existence.

12.4.4.6.2 Mortality Risk

The Proposed Scheme will not result in any increase in terms of mortality risk to common lizard during operation. This is because the Proposed Scheme is largely focused on upgrading existing infrastructure, the mortality risk of which already exists. The Proposed Scheme will neither exacerbate nor improve the level of mortality risk associated with this infrastructure. Therefore, the impact of mortality risk to common lizard, as a result of the Proposed Scheme is not considered to be significant at any geographic scale.

12.4.4.7 Amphibians

No evidence of any protected amphibian species, such as common frog or smooth newt, were identified along the Proposed Scheme during the surveys undertaken. However, suitable amphibian habitat such as vegetated riverbanks and drainage ditches were recorded within the Proposed Scheme boundary. The desk study returned records of amphibians in the vicinity of the Proposed Scheme, and therefore, impacts on these species cannot be excluded.

12.4.4.7.1 Habitat Severance / Barrier Effect

Barriers such as road infrastructure may affect foraging behaviour and dispersal corridors (e.g. the movement of species between breeding and hibernation sites), meaning that local populations can become isolated, having long-term effects on genetic diversity and gene flow, at a Local geographic scale.

As the Proposed Scheme, for the most part, will consist of upgrading existing infrastructure, the effect of habitat severance / barrier effects on amphibian species is not considered to be significant at any geographic scale. The existing infrastructure itself acts as a barrier to amphibian movement across the landscape and the Proposed Scheme will neither exacerbate nor improve the barrier effect already in existence.

12.4.4.7.2 Mortality Risk

The Proposed Scheme will not result in any increase in terms of mortality risk to amphibians during operation. This is because the Proposed Scheme is largely focused on upgrading existing infrastructure, the mortality risk

of which already exists. The Proposed Scheme will neither exacerbate nor improve the level of mortality risk associated with this infrastructure. Therefore, the impact of mortality risk to amphibians, as a result of the Proposed Scheme is not considered to be significant at any geographic scale.

12.4.4.7.3 Habitat Degradation – Surface Water Quality

As discussed in Section 12.4.4.2.1, without the design mitigation incorporated into the design of the Proposed Scheme, the Operational Phase of the Proposed Scheme could result in contamination of receiving water bodies. This could result in significant negative impacts on amphibians either directly (e.g., acute or sub-lethal toxicity from pollutants) or indirectly (e.g. affecting their food supply or supporting habitats).

Habitat degradation as a result of effects on surface water quality during operation has the potential to affect the conservation status of amphibians and result in a likely Negative and Significant effect, at a Local geographic scale. This is in consideration of the temporary nature and scale of the proposed impact, the availability of suitable habitat for amphibians in the wider vicinity and the relative abundance of amphibians across the wider environment, as demonstrated in the results of the desk study.

12.4.4.8 Fish

12.4.4.8.1 Habitat Severance / Barrier Effect

The proposed Royal Canal pedestrian / cycle bridge has been designed in consultation with IFI / Waterways Ireland and the design criteria set out in Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes (NRA 2005a) and the Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters (IFI 2016). This will maintain fish passage during the operation of the Proposed Scheme and therefore, will result in a Neutral impact to fish species.

There will be a narrow reduction in the width of the Royal Canal at the location of the proposed Royal Canal pedestrian / cycle bridge. Following its completion and the cessation of works, including the extraction of temporary screens from the Royal Canal itself, the remaining channel will be fully accessible to fish and other fauna to commute along.

Given the relative size of the Proposed Scheme and the considerable availability of canal habitat for coarse fish, the habitat severance / barrier effect during operation on coarse fish species (and potentially eel) is not considered to be significant at any geographic scale.

12.4.4.8.2 Habitat Degradation – Surface Water Quality

As discussed in Section 12.4.4.2.1, without the design mitigation incorporated into the design of the Proposed Scheme, the Operational Phase of the Proposed Scheme could potentially result in contamination of receiving water bodies. This could result in significant negative impacts on European eel and other fish species either directly (e.g. acute or sub-lethal toxicity from pollutants) or indirectly (e.g. affecting their food supply or supporting habitats).

Habitat degradation as a result of effects on surface water quality during operation has the potential to affect the conservation status of fish species and result in a likely Negative and Significant effect, at a Local geographic scale. This is in consideration of the temporary nature and scale of the potential impact.

12.4.4.9 Invertebrates

12.4.4.9.1 Habitat Degradation – Surface Water Quality

As discussed in Section 12.4.4.2.1, without the design mitigation incorporated into the design of the Proposed Scheme, the Operational Phase of the Proposed Scheme could potentially result in contamination of receiving water bodies. This could result in significant negative impacts on red-listed non-marine mollusc species either directly (e.g. acute or sub-lethal toxicity from pollutants) or indirectly (e.g. affecting their food supply or supporting habitats).

Habitat degradation as a result of effects on surface water quality during operation has the potential to affect the conservation status of red-listed non-marine mollusc species and result in a likely Negative and Significant effect, at a Local geographic scale. This is in consideration of the temporary nature and scale of the potential impact.

12.4.4.10 Summary of Potential Operational Phase Impacts (Pre-Mitigation)

Table 12.15: Summary of Potential Operational Phase Impacts

Ecological Receptor	Ecological Valuation	Potential Impacts	Potential Significance
Designated Areas for Nature Conservation			
North Dublin Bay SAC; North Dublin Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the International geographic scale
South Dublin Bay SAC South Dublin Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the International geographic scale
Howth Head SAC Howth Head pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International geographic scale
Rockabill to Dalkey Island SAC Dalkey Coastal Zone and Killiney Hill pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International geographic scale
Lambay Island SAC Lambay Island pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International geographic scale
South Dublin Bay and River Tolka Estuary SPA Booterstown Marsh pNHA Dolphins, Dublin Docks pNHA South Dublin Bay pNHA North Dublin Bay pNHA	International Importance National Importance National Importance National Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the International geographic scale
Baldoyle Bay SPA Baldoyle Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International geographic scale
North Bull Island SPA North Dublin Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the International geographic scale
Malahide Estuary SPA Malahide Estuary pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International geographic scale
Ireland's Eye SPA Ireland's Eye pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International geographic scale
Howth Head Coast SPA Howth Head pNHA	International Importance	Habitat Degradation (hydrology)	Likely significant effect at the International geographic scale

Ecological Receptor	Ecological Valuation	Potential Impacts	Potential Significance
	National Importance		
Rogerstown Estuary SPA Portrairie Shore pNHA Rogerstown pNHA	International Importance National Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International geographic scale
Lambay Island SPA Lambay Island pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International geographic scale
Dalkey Island SPA Dalkey Coastal Zone and Killiney Hill pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International geographic scale
Skerries Islands SPA Skerries Islands NHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International geographic scale
The Murrough SPA The Murrough pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International geographic scale
The Royal Canal pNHA	National Importance	Habitat Loss; Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the National geographic scale
Habitats (outside of designated areas for nature conservation)			
Tidal rivers (CW2)	National Importance	Habitat degradation (hydrology; non-native invasive plant species)	Likely to be significant at the National geographic scale
Depositing / lowland rivers (FW2)	Local Importance (Higher Value)	Habitat degradation (hydrology; non-native invasive plant species)	Likely to be significant at the Local geographic scale
Canal (FW3)	National Importance	Habitat Loss; Habitat degradation (hydrology; non-native invasive plant species)	Likely significant effect at the National geographic scale
Large Reed and Sedge Swamp (FS1)	National Importance	Habitat Loss; Habitat degradation (hydrology; non-native invasive plant species)	Likely significant effect at the National geographic scale
(Mixed) broadleaved woodland (WD1)	Local Importance (Higher Value)	Habitat degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale
Scattered trees and parkland (WD5)	Local Importance (Higher Value)	Habitat degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale
Hedgerows (WL1)	Local Importance (Higher Value)	Habitat degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale
Treelines (WL2)	Local Importance (Higher Value)	Habitat degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale
Rare / Protected Plant Species			
Opposite-leaved pondweed	National Importance	Habitat degradation (hydrology)	Not likely to be significant at any geographic scale
Fauna Species			
Bats	Local Importance (Higher Value)	Indirect Disturbance of Flight Patterns Due to Operational Phase Lighting; Disturbance / displacement – Increased Human Activity	Likely significant effect at the Local geographic scale

Ecological Receptor	Ecological Valuation	Potential Impacts	Potential Significance
Badger	Local Importance (Higher Value)	Habitat severance / barrier effect; mortality risk; light spill	Not likely to be significant at any geographic scale
Otter	National Importance	Habitat severance / barrier effect; Disturbance / displacement; Habitat and Food Resource degradation – Surface Water Quality; Mortality risk	Likely to be significant at the Local geographic scale
Marine mammals	International – County Importance	Surface Water Quality and Prey Abundance	Likely to be significant at the Local geographic scale
Other mammals	Local Importance (Higher Value)	Habitat Severance / Barrier Effect; Mortality Risk; Habitat degradation – light spill	Likely significant effect at the Local geographic scale
SCI bird species	International Importance	See SPAs above	See SPAs above
All other breeding bird species (non-SCI)	Local Importance (Higher Value)	Disturbance/ displacement, Habitat Degradation (hydrology)	Likely to be significant at the Local geographic scale
All other wintering bird species (non-SCI)	Local Importance (Higher Value)	Disturbance/ displacement, Habitat Degradation (hydrology)	Likely to be significant at the Local geographic scale
Amphibians	Local Importance (Higher Value)	Habitat Degradation (hydrology); Habitat severance/ barrier effect; Mortality risk	Likely to be significant at the Local geographic scale
Non-Annex fish species (e.g. brown trout, European eel)	Local Importance (Higher Value) – National importance	Habitat severance / barrier effect, Habitat Degradation (hydrology);	Likely to be significant at the Local geographic scale
Invertebrates (aquatic)	Local Importance (Higher Value)	Habitat Degradation (hydrology);	Likely to be significant at the Local geographic scale

12.5 Mitigation and Monitoring Measures

12.5.1 Construction Phase

Where deemed necessary, a suitably experienced and qualified ecologist will be employed by the appointed contractor. The ecologist will advise the appointed contractor on ecological matters during construction, communicate all findings in a timely manner to the NTA and statutory authorities, acquire any licenses / consents required to conduct the work, and supervise and direct the ecological measures associated with the Proposed Scheme.

12.5.1.1 Designated Areas for Nature Conservation

12.5.1.1.1 European sites

The mitigation measures that are required to ensure that the Proposed Scheme will not adversely affect the integrity of the European sites within the Zol are presented in the NIS. Following consideration and assessment of the Proposed Scheme on the identified relevant European sites, the following mitigation measures were developed to address potential impacts that were identified:

- Measures to protect surface water quality during construction; and
- Measures to prevent the spread of non-native invasive species to downstream European sites.

12.5.1.1.2 National Sites

The mitigation measures in relation to potential impacts arising from the Proposed Scheme on NHA and pNHAs within the Zol are as per those for European sites as the boundaries coincide with the SACs and SPAs. Therefore,

the mitigation measures outlined in Section 12.5.1.1.1, and as detailed in the NIS, will prevent the Proposed Scheme resulting in a significant negative effect on these NHA and pNHAs at the National geographic scale.

The mitigation measures in relation to potential impacts arising from the Proposed Scheme on the Royal Canal pNHA include habitat loss, habitat degradation as a result of surface water / groundwater quality effects, habitat degradation as a result of air quality impacts and the spread of invasive species (see Section 12.5.1.2), effects on rare and protected plant species (see Section 12.5.1.3), and negative effects on the protected fauna species associated with the site such as mammals, riparian birds, and fish species (see Section 12.5.1.4, Section 12.5.1.5 and Section 12.5.1.8).

12.5.1.2 Habitats

12.5.1.2.1 Habitat Loss and Fragmentation

Where practicable, areas of vegetation including habitats of Local Importance (Higher Value), such as mixed broadleaved woodland, scattered trees and parkland, treeline and hedgerow habitat types which lie within the footprint, or along the boundary of the Proposed Scheme, will be retained. The areas of vegetation to be retained are shown on the Landscaping General Arrangement drawings (BCIDD-ROT-ENV_LA-0304_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

Proposed planting incorporated into the Proposed Scheme will be implemented by the appointed contractor, as listed below and displayed on the Landscaping General Arrangement drawings (BCIDD-ROT-ENV_LA-0304_XX_00-DR-LL-9001) in Volume 3 of this EIAR. These areas will be protected for the duration of construction works and fenced off at an appropriate distance.

To mitigate the loss of habitat, proposed planting incorporated into the Proposed Scheme will be implemented by the appointed contractor, as listed below and displayed on the Landscaping General Arrangement drawings in Volume 3 of this EIAR:

- 515 street trees planted;
- 2,478m of proposed hedge;
- 71m² of proposed species rich grassland;
- 6884m² of proposed native planting;
- 3562m² of proposed ornamental planting; and
- 1969m² of proposed amenity grassland planting.

12.5.1.2.2 Habitat Degradation – Surface Water Quality

In terms of mitigation, a Surface Water Management Plan (SWMP) has been prepared (provided in the CEMP in Appendix A5.1 CEMP in Volume 4 of this EIAR), which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Scheme.

It will be a condition of the Employer's Requirements that the successful contractor, immediately following appointment, must detail in the SWMP how it is intended to effectively implement all the applicable measures identified in this EIAR and any additional measures required pursuant to conditions imposed by An Bord Pleanála to any grant of approval. At a minimum, all the control and management measures set out in the SWMP will be implemented by the appointed contractor. This includes measures relating to:

- Construction Compound management including the storage of fuels and materials;
- Control of sediment;
- Use of concrete;
- Management of vehicles and plant including refueling and wheel wash facilities (if necessary); and
- Monitoring.

Scheme-specific mitigation measures which the appointed contractor will implement in relation to surface water quality at the following two areas, namely, Construction Compound B2 at St. Mobhi Drive and the proposed cycle / pedestrian bridge crossing of the Royal Canal, are summarised in the below sections.

12.5.1.2.2.1 Construction Compound B2 at St. Mobhi Drive

The following construction methods and mitigation measures have been identified and will be implemented to minimise and avoid impacts at Construction Compound B2:

- No connections between the temporary Construction Compound and the existing surface water drainage system in St Mobhi Drive will be made;
- The existing low wall along the southern boundary of the site will be retained, as far as is practicable, to provide protection to the Tolka_060 from overland flows;
- Fuel storage will be located on the western boundary of the Construction Compound, as far as possible from the surface water drain at the eastern end of St Mobhi Drive. All fuel will be stored in accordance with the SWMP in Appendix A5.1 CEMP in Volume 4 of this EIAR;
- Construction vehicles will be fuelled using a mobile fuelling bowser system on a temporary stand that is self-contained, such that any spillage is trapped into a small tank for pumping back into the bowser, or by using a flat-bed trailer base with a folding gate to be closed behind the vehicle being fuelled;
- Storage of other materials will be located on the western boundary of the Construction Compound, as far as possible from the surface water drains;
- All storage areas will be covered;
- Any cement and concrete mixing / batching will be located as far as possible from the surface water drain;
- Wheel wash areas will be closed-cycle. There will be no discharge of wheel wash water to surface water drains. Off site disposal of contaminated and silty water and sludge will be required; and
- Wastewater from cabins will be contained. Where discharge to the local sewer is required, consent from the local authority will be obtained (i.e. a temporary permit).

12.5.1.2.2.2 Proposed Cycle / Pedestrian Bridge Crossing of the Royal Canal

The following construction methods and mitigation measures have been identified and will be implemented to minimise and avoid impacts (full details of the construction methodology are provided in Chapter 5 (Construction)):

- Silt fences will be used along the southern bank to reduce the likelihood of silty water runoff during construction of the cycle ramp;
- Any water collected will be dewatered via siltbusters, or similar, before being discharged back into the canal;
- Prefabricated concrete will be used for the structure, wherever reasonably practicable, or where new concrete is batched at Construction Compounds, it will be cleaned prior to installation; and
- No plant will be refuelled within 10m of the canal.

12.5.1.2.3 Habitat Degradation – Hydrological Regime

In respect of works proposed at the Royal Canal, there will be temporary impacts on the hydrological regime, which will include the lowering of the water levels in the canal to approximately 0.5m depth in the canal between the 4th and 5th locks for the duration of the works to construct the proposed pedestrian / cycle bridge. Full details of these construction works at the canal can be found in Chapter 5 (Construction) of this EIAR. In light of the design approach and through the employment of standard environmental site practices throughout the Construction Phase, as detailed in Appendix A5.1 (CEMP) in Volume 4 of this EIAR, any changes in hydrological regime are considered temporary in nature. Any impacts of habitat degradation due to changes in hydrological regime of the River Tolka and tributaries and Liffey Estuary Lower would be temporary in nature during the Construction Phase of the Proposed Scheme. No mitigation is proposed.

12.5.1.2.4 Habitat Degradation – Groundwater

The following mitigation measures will be implemented with regard to pollution of soil and groundwater:

- The construction management of the site will be implemented by the appointed contractor and will take account of the recommendations of the CIRIA guidance Control of Water Pollution from

- Construction Sites – Guidance for consultants and contractors (Masters-Williams *et al.* 2001) to minimise as far as possible the risk of soil, groundwater and surface water contamination; and
- Measures to be implemented by the appointed contractor to minimise the risk of spills and contamination of soils and waters include:
 - Employing only a competent and experienced workforce, and site-specific training of site managers, foremen and workforce, including all subcontractors, in pollution risks and preventative measures;
 - Ensure that all areas where liquids (including fuel) are stored, or cleaning is carried out, are in designated impermeable areas that are isolated from the surrounding area and within a secondary containment system (e.g. by a roll-over bund, raised kerb, ramps or stepped access);
 - The location of any fuel storage facilities will be considered in the design of the Construction Compounds. These are to be designed in accordance with relevant guidelines and codes of best practice and will be fully bunded;
 - Good housekeeping at the site (daily site clean-ups, use of disposal bins, etc.) during the entire Construction Phase;
 - All concrete mixing and batching activities will be located in areas away from watercourses and drains;
 - Potential pollutants to be adequately secured against vandalism in containers in a dedicated secured area;
 - Provision of proper containment of potential pollutants according to codes of best practice;
 - Thorough control during the entire Construction Phase to ensure that any spillage is identified at an early stage and subsequently effectively contained and managed; and
 - Spill kits will be provided and will be kept close to the storage area. Staff will be trained on how to use spill kits correctly.

The mitigation measures to protect groundwater during the Construction Phase are outlined in Chapter 14 (Land, Soils, Geology & Hydrogeology) and Appendix A5.1 CEMP in Volume 4 of this EIAR.

12.5.1.2.5 Habitat Degradation – Air Quality

A series of mitigation measures will be implemented by the appointed contractor to minimise dust nuisance impacts:

- Public roads affected by the Proposed Scheme works will be regularly inspected for soiling associated with the construction activities and cleaned as necessary;
- Material handling systems and stockpiling of materials will be designed and laid out to minimize exposure to wind. Water misting or sprays (or similar dust suppression methods) will be used as required if particularly dusty activities associated with the construction contract are necessary during dry or windy periods;
- During movement of dust generating materials both on and off site, trucks will be covered with tarpaulin, and before entrance onto public roads, trucks will be checked to ensure the tarpaulins are properly in place;
- The appointed contractor will provide a site hoarding of 2.4m height along noise sensitive boundaries, at a minimum, at the Construction Compounds, which will assist in minimising the potential for dust impacts off site; and
- The appointed contractor will keep the effectiveness of the mitigation measures under review and revise them as necessary. In the event of dust nuisance associated with the Proposed Scheme occurring outside the works boundary, movements of materials likely to raise dust will be curtailed and satisfactory procedures implemented to rectify the problem.

12.5.1.2.6 Habitat Degradation – Non-Native Invasive Plant Species

The NTA will ensure that a confirmatory pre-construction invasive species survey will be undertaken by a suitably qualified specialist to confirm the absence and / or extent of all Third Schedule invasive species within the footprint

of the Proposed Scheme. Where an infestation is confirmed / identified, this will require the implementation of a non-native ISMP (refer to the ISMP contained in Appendix 5.1 (CEMP) of Volume 4 of this EIAR).

Following the confirmatory pre-construction survey, the following mitigation measures will be implemented, as required.

- Where a pre-construction invasive species survey identifies newly established non-native invasive species within the footprint of the Proposed Scheme, the final non-native ISMP produced will provide a detailed description of the infestations (e.g. approximate area of the respective colonies (m²), where feasible; approximate total number of stems, pattern of growth and information on other vegetation present), and where necessary, include calculations of volumes of infested soils to be excavated;
- The ISMP will be finalised following the pre-construction survey as advised by a suitably qualified specialist, with regard to the Transport Infrastructure Ireland (TII) guidance documents (i.e. The management of Invasive Alien Plant Species on National Road - technical guidance and standard (TII 2020a; TII 2020b)) and species-specific guidance documents including those listed in the non-native ISMP, of the Proposed Scheme as necessary; and
- The NTA will ensure that all control measures specified in the Proposed Scheme ISMP shall be implemented by a suitably qualified and licenced specialist prior to the construction of the Proposed Scheme to control the spread of newly established non-native invasive species within the footprint of the Proposed Scheme. Furthermore, the appointed contractor will adhere to control measures specified within the ISMP throughout the Construction Phase of the Proposed Scheme.

The site will be monitored by the appointed contractor after control measures have been implemented. Any re-growth will be subsequently treated as detailed in the Proposed Scheme ISMP.

12.5.1.3 Rare and Protected Plant Species

12.5.1.3.1 Habitat Loss and Fragmentation

While no rare or protected flora were recorded during survey, the potential for opposite-leaved pondweed *Groenlandia densa* cannot be ruled out from being present in muds within the Royal Canal. In this regard, precautionary mitigation measures are recommended. The NTA will engage a suitably qualified ecologist who will undertake a pre-construction survey during the appropriate botanical season to confirm presence / absence of the species.

Where this species is confirmed to be within an area of disturbance or habitat loss, works will not be undertaken at that section of the Royal Canal until such time that an approved and licenced translocation process is put in place. A licence application (under Section 21 of the Wildlife Acts) will be submitted by the suitably qualified ecologist engaged by the appointed contractor in consultation with the NTA to the Wildlife Licensing Unit of the NPWS to enable translocation of the species. The application shall include a detailed strategy as to the excavation and relocation of the plant and follow-on management measures for the plant. Unpublished monitoring of opposite-leaved pondweed carried out by Botanical, Environmental and Conservation (BEC) (BEC 2012) consultants on behalf of the Office of Public Works (OPW) and its dredging programme along both the Royal and Grand Canal suggests that the species is easily translocated and readily becomes reestablished. Thus, where any translocation is required, there is an abundance of suitable territory along the Royal Canal within which to translocate the species, under licence.

12.5.1.3.2 Habitat Degradation – Surface Water Quality

In terms of mitigation, a SWMP has been prepared (provided in the CEMP, Appendix A5.1 CEMP in Volume 4 of this EIAR), which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Scheme.

Specific mitigation measures which the appointed contractor will implement in relation to surface water quality are described in Chapter 13 (Water).

12.5.1.4 Mammals

12.5.1.4.1 Bats

12.5.1.4.1.1 Protection of Bats during Vegetation Clearance

All bat species and their roost sites are strictly protected under both European and Irish legislation including:

- Wildlife Acts;
- The Habitats Directive; and
- Birds and Habitats Regulations.

It is an offence to kill a bat or to damage or destroy the breeding or resting place of any bat species, and it is not necessary that the action should be deliberate for an offence to occur. This puts an onus of due diligence on anyone proposing to carry out works that might result in such damage or destruction. Under Section 54 of the Birds and Habitats Regulations, a derogation may be granted by the Minister where there is no satisfactory alternative, and the derogation is not detrimental to the maintenance of the populations of the species to which the Habitats Directive relates at a favourable conservation status in their natural range.

Six PRFs (comprising individuals or clusters of trees) were identified within the footprint of the Proposed Scheme (permanent and temporary land take) during the multidisciplinary surveys (see Figure 12.7.2 in Volume 4 of this EIAR). Five of these PRFs will be removed during the Construction Phase of the Proposed Scheme and the following mitigation measures will be implemented by the appointed contractor:

- Where works are required within the Root Protection Area (RPA) of trees (including those trees identified as PRFs), the mitigation measures as set out in the method statement within the Arboricultural Impact Assessment (refer to Appendix A17.1 in Volume 4 of this EIAR) and which follow the requirements of the British Standard Institution (BSI) British Standard (BS) 5837:2012 Trees in relation to design, demolition and construction – Recommendations will be implemented; and
- These PRFs trees will in advance of any works commencing in the area be protected by the appointed contractor for the duration of construction works associated with the Proposed Scheme.

In addition to the above the following bat specific mitigation measures (in relation to vegetation clearance) will be implemented by the appointed contractor:

- Where the qualified arborist engaged by the appointed contractor is required to assess the condition of, and advise on any repair works necessary to, any trees which are to be retained (including PRF-containing trees or category U trees), these will be notified to the appointed ecologist to be surveyed to confirm if these trees are PRF's (as done for the pre-construction surveys outlined in Section 12.5.1.4.1.2). Where these previously identified or new PRF(s) require works including removal for example due to poor condition, they will be subject to mitigation as described in Section 12.5.1.4.1.2; and
- There will be no additional lighting within 5m of any PRF during the Construction Phase of the Proposed Scheme to avoid potential disturbance to roosting bats.

12.5.1.4.1.2 Roost Loss

PRF Re-Appraisal (first step of Pre-Construction Survey)

Five PRFs are required to be removed to facilitate construction of the Proposed Scheme. Tree roosts may be established for short periods and may not be detectable when bats are not occupying the roost from an examination of a suitable tree. Furthermore, trees may become suitable for roosting bats through for example damage from a storm. Therefore, trees that are at present unsuitable may become roosts between the pre-planning assessment contained within this EIAR and the Construction Phase of the Proposed Scheme. All trees, identified as PRFs or not, to be removed within the boundary of the Proposed Scheme shall be rechecked for PRFs by an experienced bat specialist engaged by the NTA as part of a pre-construction survey. The appraisal will:

- Confirm that previously identified PRFs which are to be removed are still standing; and

- Identify whether new PRF(s) (if any) may have developed owing to damage or management change to PRFs in the intervening period between the original surveys and grant of planning.

Pre-Construction Survey

Owing to the number of PRFs originally identified, it was not practical to subject every tree to detailed survey. From the start, the iterative design development between the BusConnects Infrastructure team and ecologists has tried to reduce the number of PRF(s) required for removal.

In respect of those areas where individual or clusters of PRFs clearance cannot be avoided, it is recommended that:

- In advance of any clearance, all trees deemed to be a PRF, and which are also subject to felling / clearance will be checked for the presence of bats by a suitably qualified / licenced bat specialist (using an endoscope under a separate licence held by that individual);
- In the unlikely event that bats are found on the Proposed Scheme site during construction works such as vegetation clearance, works will immediately cease in that area and the local NPWS Conservation Ranger will be contacted;
- An application will then be made to the NPWS for a derogation licence to permit actions affecting bats or their roosts that would normally be prohibited by law;
- After licence approval from the NPWS (which may include the necessity for additional mitigation measures to those recommended here) bats may be removed by a bat specialist licenced to handle bats and released in the area in the evening following capture; and
- Only then will PRF trees be felled, and this should be undertaken 'in sections' where the section can be handled to avoid sudden movements or jarring of the sections.

Installation of Bat Boxes

In addition to mitigation proposals that may arise as result of a bat specialist pre-construction survey (e.g. emergence surveys and confirmation of roost), it is proposed to install generalist / self-cleaning bat boxes for each PRF that is confirmed to be removed (identified as part of the original surveys in support of the application or additional PRFs identified during the pre-construction survey) that are to be removed:

- Standard Schwegler 1FFH (2 number) and 3FF boxes (1 number) for all previously identified PRF trees to be removed (if extant) and any new PRF tree identified during the pre-construction reappraisal;
- The boxes will be installed 3 months in advance of felling of any PRF and in public spaces managed by the local authority as close as possible to areas of the PRF to be felled and which overlap with areas of bat activity confirmed during activity surveys undertaken as part of the EIAR;
- The boxes will be installed on the tree at a height of 3m to 5m and firmly fixed to the tree trunk;
- Where practicable, the bat boxes should be installed in an east, south and west orientation and protected from undue disturbance by selective placement away from light spill and at a height >3.5m);
- There will be 1m clearance (e.g. no overhanging branches or ivy encroachment near the installed box) around each bat box opening; and
- Installed bat boxes will be labelled and data (reference number, GPS location and photographic record) will be supplied to Bat Conservation Trust (BCT), the Local Authority Biodiversity Officer and the NPWS.

12.5.1.4.1.3 Habitat Loss and Fragmentation

Where possible, habitats of importance to bats such as scattered trees and parkland, treeline and hedgerow habitat types, which lie within the footprint, or along the boundary of the Proposed Scheme, that are not directly impacted by the Proposed Scheme will be retained. These areas will be protected for the duration of construction works and fenced off at an appropriate distance. Vegetation to be retained is shown on the Landscape and Urban Realm General Arrangement drawings (BCIDD-ROT-ENV-LA-0304_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

Planting of treeline, hedgerow and grassland habitats within the Proposed Scheme footprint will be carried out by the appointed contractor, as detailed in the landscape drawings (refer to the Landscaping and Urban Realm General Arrangement drawings (BCIDD-ROT-ENV-LA-0304_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

Many species may not roost near a road development due to disturbance (e.g. high levels of artificial lighting). Whilst the planting is not likely to fully offset the loss of foraging and commuting habitat, it is likely to provide additional foraging habitat after trees and hedgerows grow to a sufficient maturity.

12.5.1.4.1.4 Disturbance of Flight Patterns / Foraging Routes as a Result of Lighting

The appointed contractor, in liaison with the suitably qualified licensed ecologist(s), will ensure that lighting at the Construction Compounds, and active works areas in proximity to known bat activity (including watercourses), will be designed to minimise light spill and be cognisant of light spill onto these areas.

Notwithstanding the urban / suburban location of the Proposed Scheme and existing public illumination, there are areas of open and linear vegetation features that provide for bats. However, during construction, the use of security lighting such as that around the Construction Compounds and / or additional lighting required for night-time works could impact on commuting / foraging territory.

Mitigation measures to reduce light spill may include the following:

- The use of sensor / timer triggered lighting;
- LED luminaires to be used where practicable;
- Column heights to be considered to minimise light spill;
- Accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only where needed; and
- Where night-time works are required, the appointed contractor will liaise with the engaged suitably experienced and qualified ecologist(s) and implement measures to mitigate the impact of such works (especially works carried out adjacent to watercourses with known bat activity).

12.5.1.4.2 Badgers

Badger, and their breeding and resting places, are protected under the Wildlife Acts and it is an offence under that legislation to intentionally kill or injure a badger or to wilfully interfere with or destroy their breeding or resting places (setts).

12.5.1.4.2.1 Disturbance / Displacement

Although there were no signs of badger recorded during field surveys, badger could potentially establish new territory within the ZoI of the Proposed Scheme. Therefore, the NTA will ensure that a confirmatory pre-construction check of all suitable badger habitat will be completed within 12 months prior to any construction works commencing.

The presence of any new setts or significant badger activity will be treated and / or protected in accordance with the Guidelines for the Treatment of Badgers prior to the Construction of National Road Schemes (NRA 2005b).

12.5.1.4.2.2 Protection of Badgers from Accidental Harm During Construction (Excavations)

Uncovered deep excavations could be potentially hazardous for badgers commuting / foraging in the area. Badgers could fall into these excavations, becoming trapped and potentially hurt and distressed.

To protect badgers from indirect harm during construction, where practicable, open excavations will be covered when not in use and backfilled as soon as practicable by the appointed contractor.

Excavations will also be covered at night, where practicable, and any deep excavations which must be left open will have appropriate egress ramps in place to allow mammals to safely exit should they fall in.

12.5.1.4.2.3 Lighting

Refer to Section 12.5.1.4.1.4 for lighting mitigation measures.

12.5.1.4.3 Otter

Otter are listed on Annex II and Annex IV of the Habitats Directive and are strictly protected under the Birds and Habitats Regulations. Otter, and their breeding and resting places, are also protected under the Wildlife Acts and it is an offence under that legislation to intentionally kill or injure an otter or to wilfully interfere with or destroy their breeding or resting places (holts / couches). Otter are known to occur on the River Tolka, in the vicinity of the Proposed Scheme.

Given the ecological sensitivity of the Royal Canal and the River Tolka Valley, the appointed contractor will engage a suitably qualified and / or licensed ecologist(s) to oversee and advise works at watercourse crossings during construction to communicate all findings in a timely manner to the NTA and statutory authorities, to acquire any licenses / consents required to conduct the work, and to supervise and direct the ecological measures associated with the Proposed Scheme.

12.5.1.4.3.1 Loss of Breeding / Resting Sites

Although there were no signs of otter breeding / resting sites recorded during field surveys, otter could potentially establish new holt or couch sites within the ZoI of the Proposed Scheme. The NTA will ensure that a confirmatory pre-construction check of all suitable otter habitat will be completed by a suitably qualified ecologist(s) within the 12 month period prior to any construction works commencing.

The presence of any new holt / couch sites will be treated and / or protected in accordance with the Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes (NRA 2006b).

12.5.1.4.3.2 Measures to Prevent Injury / Mortality Impacts

The appointed contractor will engage a suitably qualified and / or licensed ecologist(s) to oversee and advise works at watercourse crossings:

- Where a new or reactivated holt is encountered, within 150m (up and downstream) of the watercourse crossing, the qualified ecologist(s) will consult with the NPWS in conjunction with the NTA and appointed contractor;
- The qualified ecologist will review method statements, oversee works, provide advice to the appointed contractor(s), deliver toolbox talks and temporarily halt works, if, and as necessary, having conferred with the NTA;
- To protect otters from indirect harm during construction, where practicable open excavations will be covered when not in use and backfilled as soon as practicable by the appointed contractor;
- Excavations will also be covered at night, where practicable, and any deep excavations which must be left open will have appropriate egress ramps in place to allow mammals to safely exit should they fall in; and
- Fencing requirements as per the Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes (NRA 2006b) will be erected around the Construction Compound and other working areas which are in close proximity to significant watercourses and have suitable roaming territory for otter.

12.5.1.4.3.3 Measures to Prevent Disturbance / Displacement

Where night-time works are required, the appointed contractor will liaise with the engaged suitably qualified and licenced ecologist(s) and implement measures to mitigate the impact of such works (especially works carried out adjacent to watercourses with known otter activity).

Site set up near watercourse crossings shall be undertaken in a timely manner to reduce impacts to otter. The works area will be delineated from the watercourse with hoarding by the appointed contractor to obscure the site from otter and prevent access. The construction works will commence following confirmation from the suitably

qualified ecologist that no otter holt is located within 200m of the proposed cycle / pedestrian bridge over the Royal Canal. Should an otter holt be found to be present, the suitably qualified ecologist(s) will advise, in discussion with the NTA and the appointed contractor on the appropriate actions to be taken.

Where night-working adjacent to watercourses known to support otter is required, owing to practical considerations of traffic restrictions etc., the advice of a suitably qualified ecologist must be sought by the appointed contractor and a derogation licence, if necessary, may be sought from the NPWS permitting such works in close proximity of new holt.

By virtue of the loss of a terrestrial riparian territory, corresponding to the construction of an abutment on one side of the Royal Canal, and the relocation of the existing mooring point, the appointed contractor will install planter boxes, a precast concrete trough to contain soil for aquatic plants along the water edge in front of the ramp wall.

12.5.1.4.3.4 Habitat Degradation / Reduced Prey Availability - Water Quality

A SWMP has been prepared (provided in Appendix A5.1 CEMP in Volume 4 of this EIAR), which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Scheme.

Specific mitigation measures which the appointed contractor will implement in relation to surface water quality are described in Chapter 13 (Water).

12.5.1.4.3.5 Lighting

Refer to Section 12.5.1.4.1.4 for lighting mitigation measures.

12.5.1.4.4 Marine Mammals

12.5.1.4.4.1 Habitat and Food Resource Degradation-- - Water Quality

A SWMP has been prepared (provided in Appendix A5.1 CEMP in Volume 4 of this EIAR), which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Scheme.

Specific mitigation measures which the appointed contractor will implement in relation to surface water quality are described in Chapter 13 (Water).

No additional mitigation is required.

12.5.1.4.5 Other Mammal Species

No other protected mammal species were recorded during the multidisciplinary surveys carried out along the Proposed Scheme. The Construction Phase of the Proposed Scheme is not deemed to affect the local mammal population and will not result in a likely significant negative effect, at any geographic scale.

In terms of mitigation, a SWMP has been prepared (provided in Appendix A5.1 (CEMP) in Volume 4 of this EIAR), which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Scheme. Specific mitigation measures which the appointed contractor will implement in relation to surface water quality are described in Chapter 13 (Water).

No additional mitigation is required.

12.5.1.5 Birds

12.5.1.5.1 Breeding Birds

12.5.1.5.1.1 Habitat Loss and Fragmentation

Where possible, habitats of importance to birds such as scattered trees and parkland, treeline and hedgerow habitat types, which lie within the footprint, or along the boundary of the Proposed Scheme, that are not directly impacted by the Proposed Scheme will be retained. These areas will be protected for the duration of construction works and fenced off at an appropriate distance. Vegetation to be retained is shown on the Landscaping General Arrangement drawings (BCIDD-ROT-ENV_LA-0304_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

Planting of treeline, hedgerow and grassland habitats within the Proposed Scheme footprint will be carried out by the appointed contractor, as detailed in the landscape drawings (refer to the Landscaping General Arrangement drawings (BCIDD-ROT-ENV_LA-0304_XX_00-DR-LL-9001) in Volume 3 of this EIAR for locations).

Many bird species may not nest near a road development due to disturbance (e.g. drowning out of bird song by traffic noise). Whilst the planting is not likely to fully offset the loss of breeding and foraging habitat (due to the proximity of road traffic disturbance on the operational road) it is likely to provide additional foraging habitat for some species.

12.5.1.5.1.2 Mortality Risk

Where practicable, vegetation (e.g. hedgerows, trees, scrub, bankside vegetation and grassland) will not be removed, between 1 March and 31 August, to avoid direct impacts on nesting birds.

Where the construction programme does not allow this seasonal restriction to be observed, these areas will be inspected by a suitably qualified ecologist as engaged by the appointed contractor, for the presence of breeding birds prior to clearance.

Areas found not to contain nests will be cleared within three days of the nest survey, otherwise repeat surveys will be required. Vegetation clearance will not commence where nests are present, works will resume when birds have fledged and nests are no longer in use, or an agreement is reached with the NPWS.

12.5.1.5.1.3 Disturbance / Displacement

To mitigate disturbance and / or displacement to breeding birds from noise and vibration activities, the relevant mitigation measures, as described in Chapter 9 (Noise & Vibration) will be implemented by the appointed contractor.

12.5.1.5.1.4 Habitat Degradation – Water Quality

In terms of mitigation, a SWMP has been prepared (provided in Appendix A5.1 CEMP in Volume 4 of this EIAR), which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Scheme.

Specific mitigation measures which the appointed contractor will implement in relation to surface water quality are described in Chapter 13 (Water).

12.5.1.5.2 Wintering Birds

12.5.1.5.2.1 Measures to Reduce Mortality and Disturbance / Displacement Impacts to SCI Birds Due To Vegetation Loss During Construction

In the absence of any other ecological requirement / constraint, the removal of any screening vegetation, if present adjacent to potential open territory that might be used by SCI bird species, shall be undertaken outside the statutory breeding bird season (1 March to 31 August) and before the arrival of wintering birds. Thus, vegetation

clearance in these areas shall be scheduled for September. This includes the area of vegetation removal along the boundary of R108 St. Mobhi Road and the Na Fianna CLG / Home Farm Football Club sports pitches.

However, where the construction programme does not allow these seasonal restrictions to be observed, these areas will be inspected by a suitably qualified ecologist as engaged by the appointed contractor, for the presence of wintering birds prior to clearance. Where wintering birds are observed, the suitably qualified ecologist will, in discussion with the appointed contractor, advise how works will be appropriately undertaken.

Vegetation which is not to be removed but is in close proximity to any works within the footprint of the Proposed Scheme shall be fully protected and fenced off from works activity in accordance with accepted landscaping protocols in BS 5837:2012 Trees in relation to design, demolition and construction - Recommendations (BSI 2012).

12.5.1.5.2.2 Habitat Degradation - Water Quality

In terms of mitigation, a SWMP has been prepared (provided in Appendix A5.1 CEMP in Volume 4 of this EIAR), which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Scheme.

Specific mitigation measures which the appointed contractor will implement in relation to surface water quality are described in Chapter 13 (Water).

12.5.1.6 Reptiles

No reptile species were recorded during the multidisciplinary surveys carried out along the Proposed Scheme. The Construction Phase of the Proposed Scheme is not deemed to affect the local reptile population and will not result in a likely significant negative effect, at any geographic scale. No mitigation is therefore required.

12.5.1.7 Amphibians

12.5.1.7.1 Habitat Loss, Disturbance and Mortality Risk

No amphibian species were recorded during the multidisciplinary surveys carried out along the Proposed Scheme. However, some suitable amphibian breeding habitats were noted.

If vegetation clearance works by the appointed contractor are to begin during the season where frogspawn or tadpoles may be present (i.e. February to mid-summer), or where breeding adult newts, their eggs or larvae may be present (i.e. mid-March to September), a pre-construction survey of suitable habitat will be undertaken by a suitably qualified ecologist engaged by the appointed contractor to determine whether breeding amphibians are present. Where amphibians are present, the mitigation measures outlined below will be completed before works recommence:

- In the case of common frog, any frog spawn, tadpoles, juvenile or adult frogs present will be captured, under a licence from the NPWS and removed from affected habitat by hand net and translocated to the nearest area of available suitable habitat, beyond the Zol of the Proposed Scheme;
- In the case of smooth newt, individuals will be captured, under a licence from the NPWS, and removed from affected habitat, either by hand net or by trapping, and translocated to the nearest area of available suitable habitat, beyond the Zol of the Proposed Scheme. If used, the type and design of traps shall be approved by the NPWS. This is a standard and proven method of catching and translocating smooth newt;
- If the size or depth of the habitat feature is such that it cannot be determined by a visual survey whether all amphibians have been captured, the suitably qualified ecologist engaged by the appointed contractor will advise on the appropriate course of action to confirm that no amphibian species remain. If drainage of the habitat feature is deemed to be the appropriate course of action, any mechanical pumps used will have a screen fitted, and be sited, such that no amphibian species can be sucked into the pump mechanism; and
- Any capture and translocation works shall be undertaken immediately in advance of site clearance / construction works commencing.

12.5.1.7.2 Habitat Degradation – Surface Water Quality

In terms of mitigation, a SWMP has been prepared (provided in Appendix A5.1 CEMP in Volume 4 of this EIAR), which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Scheme.

Specific mitigation measures which the appointed contractor will implement in relation to surface water quality are described in Chapter 13 (Water).

12.5.1.8 Fish

12.5.1.8.1 Habitat Loss / Severance and Barrier Effect

Instream works are proposed for the Royal Canal, which will result in a narrowing of the channel for the duration of the construction of the proposed Royal Canal pedestrian / cycle bridge.

In this regard, the design calls for the localised lowering of the water levels in the Royal Canal, followed by the emplacement of a precast concrete shell formwork in the canal in a timely manner so as to ensure working in the dry and to retain as much uninterrupted canal channel (see Chapter 5 (Construction) for further details). This should not present an impediment to fish passage as fish can swim to suitable areas subject to no interference. No further mitigation is proposed in respect of the physical alteration of the canal.

12.5.1.8.2 Habitat Degradation – Surface Water Quality

In terms of mitigation, a SWMP has been prepared (provided in Appendix A5.1 CEMP in Volume 4 of this EIAR), which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Scheme.

Specific mitigation measures which the appointed contractor will implement in relation to surface water quality are described in Chapter 13 (Water).

12.5.1.8.3 Mortality Risk

The risk of coarse fish becoming trapped during works at the Royal Canal is considered minimal given that fish have an innate skill to avoid areas where humans are working. This should ensure that the risk of mortality is reduced. No further mitigation is proposed in respect of the physical alteration of the canal.

12.5.1.8.4 Disturbance / Displacement

There will be temporary disturbance to the canal channel during construction. However, some channel will be retained for the duration. Fish tend to avoid areas of human disturbance and so will likely remain outside the works area during periods of construction activity and seek shelter of riparian vegetation. No further mitigation is proposed in respect of the physical alteration of the canal.

12.5.1.9 Invertebrates – Freshwater Molluscs

The construction of the Proposed Scheme is not expected to result in any impacts to rare or protected invertebrate species. However, in respect of potential for aquatic molluscs which are known from elsewhere in the Royal Canal, the following precautionary mitigation is recommended.

12.5.1.9.1 Habitat Loss and Fragmentation

While no rare or protected invertebrates were recorded during survey, the potential for the aquatic molluscs cannot be ruled out from muds and vegetation within the Royal Canal. In this regard, precautionary mitigation measures are recommended.

The NTA will ensure that a pre-construction mollusc survey will be undertaken by a suitably qualified ecologist during the appropriate season to confirm presence / absence of the species. Where this species is confirmed to

be within an area of disturbance or habitat loss, works will not be permitted at that section of the Royal Canal until such time that an approved process is put in place to enable translocation of the species. The suitably qualified ecologist will, in discussion with the NTA, advise on the appropriate course of action to be followed.

12.5.1.9.2 Habitat Degradation – Surface Water Quality

In terms of mitigation, a SWMP has been prepared (provided in Appendix A5.1 CEMP in Volume 4 of this EIAR), which details control and management measures for avoiding, preventing, or reducing any significant adverse impacts on the surface water environment during the Construction Phase of the Proposed Scheme.

Specific mitigation measures which the appointed contractor will implement in relation to surface water quality are described in Chapter 13 (Water).

12.5.2 Operational Phase

12.5.2.1 Designated Areas for Nature Conservation

12.5.2.1.1 European sites

The mitigation measures that are specifically required to ensure that the Proposed Scheme will not adversely affect the integrity of the European sites within the Zol are presented in the NIS. Following consideration and assessment of the Proposed Scheme on the identified relevant European sites, the following mitigation measures were developed to address potential impacts that were identified:

- Measures to protect surface water quality during operation; and
- Measures to prevent the spread of invasive species to downstream European sites.

12.5.2.1.2 National Sites

The mitigation measures in relation to potential impacts arising from the Proposed Scheme on pNHAs and the singular NHA within the Zol are similar to those for European sites as the boundaries of the pNHAs often overlap those of the SACs and SPAs. Therefore, the mitigation measures outlined above in Section 12.5.1.1.1 and as detailed in the NIS (which accompanies the planning application for approval), will prevent the Proposed Scheme resulting in a significant negative effect on these pNHAs.

The mitigation measures in relation to potential impacts arising from the Proposed Scheme on the Royal Canal pNHA, including habitat degradation as a result of surface water quality effects and the spread of invasive species (see Section 12.5.2), effects on rare and protected plant species (see Section 12.5.2.3), and negative effects on the protected fauna species associated with the sites such as mammals, riparian birds, and fish species are presented in Section 12.5.2.4, Section 12.5.2.5 and Section 12.5.2.8).

12.5.2.1.2.1 Habitat Loss / Fragmentation

Following the completion of the proposed Royal Canal pedestrian / cycle bridge, the water levels in the canal will be returned to their pre-construction levels, and with the exception of the narrow loss along one bank, the channel beneath the newly installed bridge will be returned to its pre-construction condition by the appointed contractor. Concrete wetland planter boxes will be installed at the base of the abutment ramp which will be filled with canal mud and planted with riparian vegetation by the appointed contractor.

The proposed planting incorporated into the Proposed Scheme will be implemented by the appointed contractor. Refer to the Landscaping and Urban Realm General Arrangement drawings (BCIDD-ROT-ENV_LA-0304_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

The appointed contractor will carry out annual post construction monitoring, over a two year period to ensure the successful re-establishment of vegetation within the Proposed Scheme.

12.5.2.1.2.2 Habitat Degradation – Surface Water Quality

The proposed SUDS drainage system, as shown in Proposed Surface Water Drainage Works drawings (BCIDD-ROT-DNG_RD-0304_XX_00-DR-CD-9001 in Volume 3 of this EIAR), will be installed by the appointed contractor during the Construction Phase.

Mitigation for the Operational Phase has been built into the design of the Proposed Scheme. The increase in surface water runoff from the increase in impermeable area will be managed for the Proposed Scheme by the appointed contractor through a combination of bioretention, oversized pipes and permeable paving. Where no new paved areas are proposed, the existing drainage network will be retained and utilised. The effective implementation of these measures will ensure that there is no increase in existing runoff rates from newly paved areas and appropriate treatment to ensure runoff quality. The range of measures including SUDS installed during the Construction Phase will reduce both the volume and rate of surface waters discharging into the existing surface water drainage network, as well as improving the environmental quality of any such discharges during the Operational Phase of the Proposed Scheme.

These standard drainage design controls have been proven through widespread use in developments across the country. The proposed SUDS incorporated into the design of the site are common drainage systems that are used in most development types. They are proposed and designed in accordance with the Greater Dublin Strategic Drainage Study (Irish Water 2005).

Once the Proposed Scheme is in operation, the local authorities will be required to implement a maintenance and inspection regime for SUDS which will be subject to their management procedures. No additional mitigation is required.

No further mitigation is proposed.

12.5.2.1.2.3 Habitat Degradation – Non-Native Invasive Plant Species

Once the Proposed Scheme is in operation, the local authorities will implement a maintenance and management regime subject to their management procedures, where any introduction of non-native invasive plant species will be managed. No additional mitigation is required.

12.5.2.1.2.4 Habitat Degradation – Air Quality

As discussed in Chapter 7 (Air Quality), the Proposed Scheme will have a generally neutral impact on air quality and no specific Operational Phase mitigation measures are required in respect of National sites and general habitats.

12.5.2.2 Habitats

12.5.2.2.1 Habitat Loss and Fragmentation

Replanting may commence during the Construction Phase (see Landscaping and Urban Realm General Arrangement drawings (BCIDD-ROT-ENV_LA-0304_XX_00-DR-LL-9001)) but may continue into the Operational Phase for later sections of the Proposed Scheme as necessary. As the vegetation matures, it will reintegrate with retained vegetation along and adjacent to the transport corridor. No further mitigation is required.

12.5.2.2.2 Habitat Degradation - Surface Water Quality

Refer to Section 12.5.2.1.2.2.

12.5.2.2.3 Habitat Degradation– - Non-Native Invasive Plant Species

Once the Proposed Scheme is in operation, the local authorities will implement a maintenance and management regime subject to their management procedures, where any introduction of non-native invasive plant species will be managed. No additional mitigation is required.

12.5.2.2.4 Habitat Degradation- Air Quality

As discussed in Chapter 7 (Air Quality), the Proposed Scheme will have a generally neutral impact on air quality and no specific Operational Phase mitigation measures are required in respect of biodiversity and general habitats.

12.5.2.3 Rare and Protected Plant Species

12.5.2.3.1 Habitat Loss / Fragmentation

In general, no impacts on rare and protected flora species are predicted as a result of the Operational Phase of the Proposed Scheme. Therefore, no mitigation is proposed.

However, in the event that opposite-leaved pondweed *Groenlandia densa* is reported confirmed within the works area as per the pre-construction survey detailed in Section 12.5.1, and is located within land that is required to be altered / used during construction, the mitigation strategy described in Section 12.5.1 will be implemented by the appointed contractor.

12.5.2.3.2 Habitat Degradation- Surface Water Quality

Refer to Section 12.5.2.1.2.2.

12.5.2.4 Mammals

12.5.2.4.1 Bats

The operation of the Proposed Scheme is not predicted to result in any significant effects to bats in the vicinity of the Proposed Scheme, characterised by streetscape planting which offer limited roosting potential. The bulk of sylvan areas will be directly avoided / retained and connectivity to the wider landscape is largely maintained. Notwithstanding this, mitigation which has been proposed as part of the bat mitigation strategy and may be implemented dependant on the outcome of survey and / or licenced compensatory requirements will continue into the Operational Phase of the Proposed Scheme for some time.

12.5.2.4.1.1 Habitat Loss and Loss of Breeding / Resting Sites

The operation of the Proposed Scheme is not predicted to result in any significant effects to populations of bats in the vicinity of the Proposed Scheme, particularly given that the bulk of the corridor is characterised by streetscape planting which offer limited roosting potential. There are a number of areas characterised by mixed age / mature planting adjacent to the Proposed Scheme and these areas are directly avoided by retaining them and their connectivity to the wider landscape. The replacement of trees and linear vegetation features and native or ornamental hedgeline should be undertaken at the earliest moment, as it will be a number of years before lost vegetation will be mitigated for in this regard.

Planting of treeline, hedgerow and grassland habitats within the Proposed Scheme footprint will be carried out by the appointed contractor during the Construction Phase. Refer to the Landscape General Arrangement drawings (BCIDD-ROT-ENV_LA-0304_XX_00-DR-LL-9001) in Volume 3 of this EIAR.

The appointed contractor will carry out annual post construction monitoring, over a two year period to ensure the successful re-establishment of vegetation within the Proposed Scheme.

Monitoring of Bat Boxes

Where bat boxes are installed as part of the Construction Phase of the Proposed Scheme, monitoring is required under best practice guidance (e.g. Marnell *et al.* 2022 (Bat mitigation guidelines for Ireland (NPWS 2022))). The level of post-installation monitoring will be dependent on the roost type and the number of bats present. A precautionary approach will be assumed on the basis that bats using these PRFs reflect species that were typically noted during the activity surveys and are occasionally identified from urban transport corridors.

The NTA will ensure that annual inspections of installed bat boxes will be undertaken for two years or as advised by a suitably qualified ecologist, to confirm occupancy.

Where no occupancy is noted in year one, the boxes will be relocated to another mature tree and details communicated with the BCT, the Local Authority Biodiversity Officer and the NPWS.

12.5.2.4.1.2 Indirect Disturbance of Flight Patterns Due to Operational Lighting

The operation of the Proposed Scheme is not predicted to result in any significant effects to bats in the vicinity of the Proposed Scheme. Therefore, no mitigation is required.

There are no significant effects on bats predicted during the Operational Phase of the Proposed Scheme. It is recognised that installed or relocated lighting may in certain areas and owing to the removal of vegetation result in changes to lighting dispersal, potentially into areas where previously no significant light spill was present. However, the lighting design is such that there are no areas where considerable new lighting is required. Therefore, no mitigation is required.

12.5.2.4.2 Badger

The operation of the Proposed Scheme is not predicted to result in any significant effects to populations of badger in the vicinity of the Proposed Scheme. Therefore, no mitigation is proposed.

12.5.2.4.3 Otter

There are no significant effects on otter predicted during the Operational Phase of the Proposed Scheme. The construction of the proposed Royal Canal pedestrian / cycle bridge structure will result in a partial narrowing of the Royal Canal for a short distance and will also result in the reduction of unhindered riparian access under the proposed structure. However, given the nature and width of the structure and the fact that otter are typically nocturnal, it is not predicted to result in any significant severance or barrier to local otter population. Therefore, no mitigation is proposed.

12.5.2.4.3.1 Habitat Degradation/ Reduced Prey Availability - Surface Water Quality

Refer to Section 12.5.2.1.2.2.

12.5.2.4.3.2 Displacement Effects Due to Operational Lighting

By virtue of the design and construction of the proposed Royal Canal pedestrian / cycle bridge, the lighting design has been carefully designed to avoid light spill into the canal beneath the bridge. No additional mitigation is required.

12.5.2.4.4 Marine Mammals

12.5.2.4.4.1 Habitat Degradation -- Surface Water

Refer to Section 12.5.2.1.2.2.

12.5.2.4.5 Other Mammals Species

No significant effects on other protected mammal species are predicted during the Operational Phase of the Proposed Scheme. Therefore, no mitigation is required.

12.5.2.5 Birds

12.5.2.5.1 Breeding Birds

12.5.2.5.1.1 Habitat Loss / Loss of Breeding / Resting Sites, Disturbance / Displacement

As previously mentioned, planting of treeline, hedgerow and grassland habitats within / alongside the Proposed Scheme boundary, as detailed in the Landscape General Arrangement drawings (BCIDD-ROT-ENV_LA-0304_XX_00-DR-LL-9001) in Volume 3 of this EIAR, will provide suitable habitat for the breeding bird species recorded within the study area.

Many species may not nest in close proximity to the Proposed Scheme due to traffic disturbance (e.g. drowning out of bird song by traffic noise). Whilst the planting is not likely to fully offset the loss of breeding habitat (due to the proximity of traffic disturbance in relation to proposed planting locations) it is likely to provide additional foraging habitat for some species.

The appointed contractor will carry out annual post construction monitoring, over a two year period to ensure the successful re-establishment of vegetation within the Proposed Scheme.

12.5.2.5.1.2 Habitat Degradation- Surface Water

Refer to Section 12.5.2.1.2.2.

12.5.2.5.2 Wintering Birds

12.5.2.5.2.1 Measures to Reduce Impacts to SCI Birds due to Vegetation Loss

Although wintering birds are not a KER in respect of the Proposed Scheme, nonetheless following completion of the Construction Phase, planting of treeline, hedgerow and grassland habitats within the Proposed Scheme boundary will, over time, mature as re-establishment occurs and the transport corridor will be very similar to the baseline environment. No additional mitigation is required.

Planting of treeline, hedgerow and grassland habitats within the Proposed Scheme footprint will be carried out by the appointed contractor. Re-establishment of vegetation, including re-grassing at these areas is to be done outside of the wintering bird season, but as soon as practicable after completion of a section of works.

The appointed contractor will carry out annual post construction monitoring, over a two year period to ensure the successful re-establishment of vegetation within the Proposed Scheme.

12.5.2.5.2.2 Habitat Degradation - Surface Water

Refer to Section 12.5.2.1.2.2.

12.5.2.6 Reptiles

No significant effects are predicted during the Operational Phase of the Proposed Scheme. Therefore, no mitigation is required.

12.5.2.7 Amphibians

12.5.2.7.1 Habitat Degradation - Surface Water

Refer to Section 12.5.2.1.2.2.

12.5.2.8 Fish

12.5.2.8.1 Habitat Loss / Severance and Barrier Effect

The construction of the proposed Royal Canal pedestrian / cycle bridge will result in the partial narrowing of the Royal Canal, by virtue of the presence of one abutment partially extending into the aquatic environs of the canal. During the Operational Phase, however, it is not predicted that the number nor distribution of coarse fish documented from the canal will decline owing to a minimal reduction of canal habitat in the context of the overall corridor within the pNHA. Therefore, no additional mitigation is required.

12.5.2.8.2 Habitat Degradation – Surface Water Quality

Refer to Section 12.5.2.1.2.2.

12.5.2.9 Invertebrates – Freshwater Molluscs

The Operational Phase of the Proposed Scheme is not predicted to result in any significant effects to terrestrial invertebrates in the vicinity of the Proposed Scheme. Therefore, no mitigation is proposed. However, precautionary mitigation is recommended in respect of aquatic invertebrates, as they are known from other parts of the Royal Canal.

12.5.2.9.1 Habitat Degradation - Surface Water

Refer to Section 12.5.2.1.2.2.

12.6 Residual Impacts

12.6.1 Construction Phase

Following the implementation of the mitigation measures outlined in Section 12.5.1, the Proposed Scheme will not result in any significant residual effect on the KERs identified (see Table 12.16) above the Local scale on its own, or cumulatively together with other proposed developments during the Construction Phase.

Table 12.16: Summary of Construction Phase Significant Residual Impacts

Ecological Receptor	Ecological Valuation	Predicted Impact (Pre-Mitigation and Monitoring)	Potential Significance	Significant Residual Impact (Post Mitigation and Monitoring)
Designated Areas for Nature Conservation				
North Dublin Bay SAC; North Dublin Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the International to National geographic scale	No significant residual effect
South Dublin Bay SAC South Dublin Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the International to National geographic scale	No significant residual effect
Howth Head SAC Howth Head pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
Rockabill to Dalkey Island SAC Dalkey Coastal Zone and Killiney Hill pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
Lambay Island SAC Lambay Island pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to	No significant residual effect

Ecological Receptor	Ecological Valuation	Predicted Impact (Pre-Mitigation and Monitoring)	Potential Significance	Significant Residual Impact (Post Mitigation and Monitoring)
			National geographic scale	
South Dublin Bay and River Tolka Estuary SPA Dolphins, Dublin Docks pNHA South Dublin Bay pNHA Boosterstown Marsh pNHA	International Importance National Importance National Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species); Disturbance and Displacement	Likely significant effect at the International to National geographic scale	No significant residual effect
North Bull Island SPA North Dublin Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species); Disturbance and Displacement)	Likely significant effect at the International to National geographic scale	No significant residual effect
Baldoyle Bay SPA Baldoyle Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology); Disturbance and Displacement	Likely significant effect at the International to National geographic scale	No significant residual effect
Malahide Estuary SPA Malahide Estuary pNHA	International Importance National Importance	Habitat Degradation (hydrology); Disturbance and Displacement)	Likely significant effect at the International to National geographic scale	No significant residual effect
Ireland's Eye SPA Ireland's Eye pNHA	International Importance National Importance	Habitat Degradation (hydrology); Disturbance and Displacement)	Likely significant effect at the International to National geographic scale	No significant residual effect
Howth Head Coast SPA Howth Head pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
Rogerstown Estuary SPA Portraine Shore pNHA Rogerstown pNHA	International Importance National Importance National Importance	Habitat Degradation (hydrology); Disturbance and Displacement)	Likely significant effect at the International to National geographic scale	No significant residual effect
Lambay Island SPA Lambay Island pNHA	International Importance National Importance	Habitat Degradation (hydrology); Disturbance and Displacement)	Likely significant effect at the International to National geographic scale	No significant residual effect
Dalkey Island SPA Dalkey Coastal Zone and Killiney Hill pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
Skerries Islands SPA Skerries Islands NHA	International Importance National Importance	Habitat Degradation (hydrology) ; Disturbance and Displacement)	Likely significant effect at the International to National geographic scale	No significant residual effect
Rockabill SPA Rockabill Island pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
The Murrrough SPA The Murrrough pNHA	International Importance National Importance	Habitat Degradation (hydrology) ; Disturbance and Displacement)	Likely significant effect at the International to National geographic scale	No significant residual effect

Ecological Receptor	Ecological Valuation	Predicted Impact (Pre-Mitigation and Monitoring)	Potential Significance	Significant Residual Impact (Post Mitigation and Monitoring)
The Royal Canal pNHA	National Importance	Habitat Loss and Fragmentation, Habitat Degradation (hydrology; hydrological regime, groundwater, non-native invasive plant species, air quality)	Likely significant negative effect at the Local geographic scale Likely significant effect at the National geographic scale	Likely significant effect at the Local geographic scale
Habitats (outside of designated areas for nature conservation)				
Tidal Rivers (CW2) (corresponding to Annex I Estuaries [1130])	National Importance	Habitat degradation (surface water quality; non-native invasive plant species)	Likely significant effect at the National geographic scale	No significant residual effect
Depositing / lowland rivers (FW2)	Local Importance (Higher Value)	Habitat degradation (surface water quality; non-native invasive plant species)	Likely significant effect at the Local - County geographic scale depending on watercourse in question	No significant residual effect
Canals (FW3)	National Importance	Habitat Loss and fragmentation; Habitat degradation (Surface Water Quality; non-native invasive plant species)	Likely significant effect at the national geographic scale	No significant residual effect
Large Reed and Sedge Swamp (FS1)	National Importance	Habitat Loss and fragmentation; Habitat degradation (Surface Water Quality; non-native invasive plant species)	Likely significant effect at the national geographic scale	No significant residual effect
(Mixed) broadleaved woodland (WD1)	Local Importance (Higher Value)	Habitat Loss and Fragmentation, Habitat Degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale	No significant residual effect
Scattered trees and parkland (WD5)	Local Importance (Higher Value)	Habitat Loss and Fragmentation, Habitat Degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale	No significant residual effect
Hedgerows (WL1)	Local Importance (Higher Value)	Habitat Loss and Fragmentation, Habitat Degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale	No significant residual effect
Treelines (WL2)	Local Importance (Higher Value)	Habitat Loss and Fragmentation, Habitat Degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale	No significant residual effect
Rare / Protected Plant Species				
Opposite-leaved pondweed	National Importance	Habitat Loss, Habitat degradation (surface water quality ; hydrological regime)	Likely significant effect at the Local to National geographic scale	No significant residual effect
Fauna Species				
Bats	Local Importance (Higher Value)	Roost Loss, Habitat loss as a result of fragmentation of foraging / commuting habitat and commuting routes; Installation of temporary working and construction compound Lighting causing indirect disturbance of flight patterns	Likely significant effect at the Local geographic scale	No significant residual effect
Badger	Local Importance (Higher Value)	Loss of Foraging habitat and breeding / resting places, Disturbance / displacement; mortality risk	Not likely significant effect at the Local geographic scale	No significant residual effect

Ecological Receptor	Ecological Valuation	Predicted Impact (Pre-Mitigation and Monitoring)	Potential Significance	Significant Residual Impact (Post Mitigation and Monitoring)
Otter	County Importance	habitat and food source degradation – water quality; habitat severance / barrier effect; disturbance / displacement - lighting)	Likely significant effect at the Local geographic scale	No significant residual effect
Marine mammals	County Importance – International Importance	Habitat and food resource degradation – Water Quality	Likely significant effect at the Local geographic scale	No significant residual effect
Other Mammal species protected under the Wildlife Acts	Local Importance (Higher Value)	Mortality Risk	Not likely significant effect at the Local geographic scale	No significant residual effect
SCI bird species	International Importance	See SPAs above	See SPAs above	No significant residual effect
All other breeding bird species (non-SCI)	Local Importance (Higher Value)	Habitat Degradation (hydrology)	Likely significant effect at the Local geographic scale	No significant residual effect
All other wintering bird species (non-SCI)	Local Importance (Higher Value)	Habitat Degradation (hydrology)	Likely significant effect at the Local geographic scale	No significant residual effect
Amphibians	Local Importance (Higher Value)	Habitat Degradation - surface water quality;	Likely significant effect at the Local geographic scale	No significant residual effect
Non-Annex fish species (e.g. brown trout, European eel)	Local Importance (Higher Value) – National Importance	Habitat Loss / severance and barrier effect; Habitat Degradation – surface water quality; Mortality Risk	Likely significant effect at the Local geographic scale	No significant residual effect
Invertebrates (aquatic)	Local Importance (Higher Value)	Habitat Loss; Habitat Degradation (surface water quality)	Likely significant effect at the Local geographic scale	No significant residual effect

12.6.2 Operational Phase

Following the implementation of the mitigation measures outlined in Section 12.5.2 (as well as those described in Section 12.5.1 which continue into the Operational Phase), the Proposed Scheme will not result in any significant residual effect on the KERs identified (see Table 12.17) on its own, or cumulatively together with other proposed developments during the Operational Phase.

Table 12.17: Summary of Operational Phase Significant Residual Impacts

Ecological Receptor	Ecological Valuation	Potential Impacts (Pre-Mitigation and Monitoring)	Potential Significance	Significant Residual Impact (Post Mitigation and Monitoring)
Designated Areas for Nature Conservation				
North Dublin Bay SAC; North Dublin Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the International to National geographic scale	No significant residual effect
South Dublin Bay SAC South Dublin Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the International to National geographic scale	No significant residual effect
Howth Head SAC Howth Head pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
Rockabill to Dalkey Island SAC Dalkey Coastal Zone and Killiney Hill pNHA	International Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect

Ecological Receptor	Ecological Valuation	Potential Impacts (Pre-Mitigation and Monitoring)	Potential Significance	Significant Residual Impact (Post Mitigation and Monitoring)
	National Importance			
Lambay Island SAC Lambay Island pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
South Dublin Bay and River Tolka Estuary SPA Dolphins, Dublin Docks pNHA South Dublin Bay pNHA Booterstown Marsh pNHA	International Importance National Importance National Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the International to National geographic scale	No significant residual effect
North Bull Island SPA North Dublin Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the International to National geographic scale	No significant residual effect
Baldoyle Bay SPA Baldoyle Bay pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
Malahide Estuary SPA Malahide Estuary pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
Ireland's Eye SPA Ireland's Eye pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
Howth Head Coast SPA Howth Head pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
Rogerstown Estuary SPA Portraine Shore pNHA Rogerstown pNHA	International Importance National Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
Lambay Island SPA Lambay Island pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
Dalkey Island SPA Dalkey Coastal Zone and Killiney Hill pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
Skerries Islands SPA Skerries Islands NHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
Rockabill SPA Rockabill Island pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International geographic scale	No significant residual effect

Ecological Receptor	Ecological Valuation	Potential Impacts (Pre-Mitigation and Monitoring)	Potential Significance	Significant Residual Impact (Post Mitigation and Monitoring)
The Murrrough SPA The Murrrough pNHA	International Importance National Importance	Habitat Degradation (hydrology)	Likely significant effect at the International to National geographic scale	No significant residual effect
The Royal Canal pNHA	National Importance	Habitat Loss; Habitat Degradation (hydrology; non-native invasive plant species)	Likely at the National geographic scale	No significant residual effect
Habitats (outside of designated areas for nature conservation)				
Tidal Rivers (CW2) (corresponding to Annex I Estuaries [1130])	National Importance	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the National geographic scale	No significant residual effect
Depositing / lowland rivers (FW2)	Local Importance (Higher Value)	Habitat Degradation (hydrology; non-native invasive plant species)	Likely significant effect at the Local geographic scale	No significant residual effect
Canals (FW3)	National Importance	Habitat Loss; Habitat degradation (hydrology; non-native invasive plant species)	Likely at the National geographic scale	No significant residual effect
Large Reed and Sedge Swamp (FS1)	National Importance	Habitat Loss; Habitat degradation (hydrology; non-native invasive plant species)	Likely at the National geographic scale	No significant residual effect
(Mixed) broadleaved woodland (WD1);	Local Importance (Higher Value)	Habitat degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale	No significant residual effect
Scattered trees and parkland (WD5)	Local Importance (Higher Value)	Habitat degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale	No significant residual effect
Hedgerows (WL1)	Local Importance (Higher Value)	Habitat degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale	No significant residual effect
Treelines (WL2)	Local Importance (Higher Value)	Habitat degradation (non-native invasive plant species)	Likely significant effect at the Local geographic scale	No significant residual effect
Rare / Protected Plant Species				
Opposite-leaved pondweed	National Importance	Habitat degradation (hydrology)	Not likely significant effect at the Local geographic scale	No significant residual effect
Fauna Species				
Bats	Local Importance (Higher Value)	Disturbance / displacement – increased human activity	Likely significant effect at the Local geographic scale	No significant residual effect
Badger	Local Importance (Higher Value)	Habitat severance / barrier effect; mortality risk; light spill	Not likely to be significant at any geographic scale	No significant residual effect
Otter	National Importance	Habitat severance / barrier effect; Disturbance / displacement; Habitat and food source degradation - surface water quality; Mortality risk	Likely to be significant at the Local geographic scale	No significant residual effect
Marine mammals	County - International Importance	Surface water quality and prey abundance	Likely to be significant at the Local geographic scale	No significant residual effect
Other Mammals	Local Importance (Higher Value)	Habitat Degradation- light spill	Likely significant effect at the Local geographic scale	No significant residual effect
SCI bird species	International Importance	See SPAs above	See SPAs above	No significant residual effect

Ecological Receptor	Ecological Valuation	Potential Impacts (Pre-Mitigation and Monitoring)	Potential Significance	Significant Residual Impact (Post Mitigation and Monitoring)
All other breeding bird species (non-SCI)	Local Importance (Higher Value)	Disturbance/ displacement, Habitat Degradation (hydrology)	Likely to be significant at the Local geographic scale	No significant residual effect
All other wintering bird species (non-SCI)	Local Importance (Higher Value)	Disturbance/ displacement, Habitat Degradation (hydrology)	Likely to be significant at the Local geographic scale	No significant residual effect
Amphibians	Local Importance (Higher Value)	Habitat Degradation (hydrology); Habitat severance / barrier effect; Mortality risk	Not likely to be significant at any geographic scale	No significant residual effect
Non-Annex fish species (e.g. brown trout, European eel)	Local Importance (Higher Value) – National importance	Habitat severance / barrier effect, Habitat Degradation (hydrology)	Likely to be significant at the Local geographic scale	No significant residual effect
Invertebrates (aquatic)	Local Importance (Higher Value)	Habitat Degradation (hydrology);	Likely to be significant at the Local geographic scale	No significant residual effect

12.7 References

Andrews, H. (2018). Bat Roosts in Trees: A Guide to Identification and Assessment for Tree-Care and Ecology Professionals. Bat Tree Habitat Key.

Aquafact (2020) JN1603 Electrofishing and Q values, River Poddle DCC and SCCC Report Approval Sheet Client DCC and SCCC Report Title Electrofishing survey and Q value analyses of the Poddle River

Aughney, T., Roche, N. & Langton, S. (2018). The Irish Bat Monitoring Programme 2015-2017. Irish Wildlife Manuals, No. 103. National Parks and Wildlife Service, Department of Culture Heritage and the Gaeltacht, Ireland.

Bailey, M. and Rochford, J. (2006). Otter Survey of Ireland 2004/2005 Irish Wildlife Manuals, No. 23. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

BCI (2020/1) Bat Conservation Ireland Database.

BEC Consultants (2012). Monitoring of Opposite-leaved Pondweed (*Groenlandia densa*) in the Royal and Grand Canals. Unpublished report: <http://www.botanicalenvironmental.com/projects/rare-threatened-species/plants/monitoring-populations-of-opposite-leaved-pondweed-groenlandia-densa-in-the-royal-and-grand-canal-co-dublin/>

Benson, L. (2009). Use of Inland Feeding Sites by Light-bellied Brent Geese in Dublin 2008-2009: A New Conservation Concern? Irish Birds 8: 563-570.

Biesmeijer, J.C., Roberts, S.P.M., Reemer, M., Ohlemüller, R., Edwards, M., Peeters, T., Schaffers, A.P., Potts, S.G., Kleukers, R., Thomas, C.D., Settele, J., Kunin, W.E. (2006). Parallel declines in pollinators and insect-pollinated plants in Britain and the Netherlands. *Science*, 313, 351–354.

Bignal K. L., Ashmore M. R., Headley A. D., Stewart K, Weigert K., (2007). Ecological impacts of air pollution from road transport on local vegetation. *Applied Geochemistry*. Vol. 22, Issue 6, Pg. 1264-1271.

Bignal, K., Ashmore, M. & Power, S. (2004). The Ecological Effects Of Diffuse Air Pollution From Road Transport. English Nature Research Report No. 580, Peterborough

BirdWatch Ireland (2021) Various species Description and habitat preferences. Available at www.birdwatchireland.ie

BSI (2008). Code of practice for noise and vibration control on construction and open sites – Part 1: Noise (BS 5228-1:2009+A1:2014). British Standards Institution.

BSI (2012). Trees in relation to design, demolition and construction – Recommendations (BS 5837:2012). British Standards Institution.

Butterfly Conservation Ireland (2020). Butterfly Conservation Ireland Annual Report 2020.

Byrne, A., Moorkens, E.A., Anderson, R., Killeen, I.J. & Regan, E.C. (2009) Ireland Red List No. 2 – NonMarine Molluscs. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

CBD (1992). Article 2 of the Convention on Biological Diversity, United Nations

Cheal, F., J. A. Davis, J. E. Gowns, J. S. Bradley, and F. H. Whittles, (1993). The influence of sampling method on the classification of wetland macroinvertebrate communities. *Hydrobiologia* 257:47–56.

CIEEM (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine. Chartered Institute of Ecology and Environmental Management, Winchester.

- CIEEM (2021). Advice on Ecological Assessment of Air Quality Impacts. Chartered Institute of Ecology and Environmental Management, Winchester.
- Collins, J. (2016). Bat Surveys for Professional Ecologists: Good Practice Guidelines 3rd edition. The Bat Conservation Trust, London.
- Cutts, N., Phelps, A., Burdon, D. (2009). Construction and Waterfowl: Defining Sensitivity, Response, Impact and Guidance. Report prepared by the Institute of Estuarine and Coastal Studies University of Hull and Humber INCA.
- Dao L, Morrison L, Kiely G, Zhang C (2013). Spatial distribution of potentially bioavailable metals in surface soils of a contaminated sports ground in Galway, Ireland. *Environ Geochem Health* 35(2):227–238. Department of Culture, Heritage and the Gaeltacht, DCHG, (2017). National Biodiversity Plan 2017 – 2021.
- DCC (2015). Dublin City Biodiversity Action Plan 2015-2020.
- DCC (2016). Dublin City Development Plan 2016-2022. [Online] Available from data.gov.ie/dataset/sustainable-urban-drainage-systems-suds-resgister-and-map
- DCHG (2017). National Biodiversity Plan 2017 - 2021
- DHPLG (2018). River Basin Management Plan (RBMP) 2018 – 2021.
- Doogue, D., Nash, D., Parnell, J., Reynolds, S. & Wyse Jackson, P. (1998). Flora of County Dublin. The Dublin Naturalists' Field Club, Dublin.
- EA (2003) Environment Agency's 'River Habitat Survey in Britain and Ireland' Field Survey Guidance Manual: 2003 Version. Environment Agency, UK.
- EA (2010). Fifth Otter Survey of England 2009-2012. Full Technical Report. Environment Agency, UK.
- EPA (2018). Water Quality in 2017: An Indicators Report. Compiled by Wayne Trodd and Shane O'Boyle. Published By The Environmental Protection Agency, Ireland November 2018. Available at <https://www.epa.ie/publications/monitoring--assessment/freshwater--marine/Water-Quality-in-2017---an-indicators-report.pdf>
- EPA (2020). EPA Maps [Online] Available from gis.epa.ie/EPAMaps/
- EPA (2022). Guidelines on the Information to be Contained in Environmental Impact Assessment Reports.
- European Commission (2013). Guidance on Integrating Climate Change and Biodiversity into Environmental Impact Assessment.
- European Commission (2017). Environmental Impact Assessment of Projects. Guidance on the preparation of the Environmental Impact Assessment Report (Directive 2011/92/EU as amended by 2014/52/EU).
- Farren, A., Prodöhl, P., Laming, P., Reid, N. (2010). Distribution of the common lizard (*Zootoca vivipara*) and landscape favourability for the species in Northern Ireland. *Amphibia-Reptilia*, 31(3), 387-387.
- FCC (2010). Fingal Biodiversity Action Plan 2010 - 2015
- FCC (2017). Fingal Development Plan 2017 - 2023
- Feeley, H.B., Baars, J-R., Kelly-Quinn, M. & Nelson, B. (2020) Ireland Red List No. 13: Stoneflies (Plecoptera). National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht, Dublin, Ireland
- Fitzpatrick, U., Murray, T.E. Paxton, R.J. Brown, M.J.F. (2006). Building on IUCN National Red Lists to produce national lists of conservation priorities – a model using Irish bees (submitted to Conservation Biology).

- Fossitt, J. A. (2000). A Guide to Habitats in Ireland. Heritage Council, Kilkenny, Ireland.
- Foster, G. N., Nelson, B. H. & O Connor, Á. (2009) Ireland Red List No. 1 – Water beetles. National Parks and Wildlife Service
- Gammell, M., McFarlane, A., Brady, D., O'Brien, J., Mirimin, L., Graham, C., Lally, H., Minto, C. & O'Connor, I. (2021) White-clawed Crayfish *Austropotamobius pallipes* survey in designated SACs in 2017. Irish Wildlife Manuals, No. 131. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage, Ireland.
- Gilbert, G., Gibbons, D. W. & Evans, J. (1998). Bird Monitoring Methods. RSPB, Sandy.
- Gilbert, G., Stanbury, A., Lewis, L. (2021). Birds of Conservation Concern in Ireland 4: 2020–2026. Irish Birds 9: 523-544.
- Greater Dublin Drainage (2012) Alternative Sites Assessment - Phase Two Sites Assessment and Route Selection Report. Ecology. May 2012. Available at http://www.greaterdublindrainage.com/wp-content/uploads/2012/05/Appendix-5_Ecology-Assessment.pdf
- Hayden T. J., Harrington, R. (2000). Exploring Irish Mammals. Town House 2000.
- IAQM (2020). A Guide to the Assessment of Air Quality Impacts on Designated Nature Conservation Sites (Version 1.1)
- IFI (2010). Sampling Fish for the Water Framework Directive. Transitional Waters 2010- Liffey Estuary
- IFI (2016). Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters.
- Irish Water (2005). Greater Dublin Strategic Drainage Study – Final Strategy Report
- Irish Wildlife Trust, IWT, (2012). Cork City Urban Otter Survey 2011-2012. Irish Wildlife Trust.
- Jacoby, D. & Gollock, M. 2014. *Anguilla anguilla*. The IUCN Red List of Threatened Species 2014: e.T60344A45833138. <http://dx.doi.org/10.2305/IUCN.UK.2014-1.RLTS.T60344A45833138.en>
- Kelleher, C. & Marnell, F. (2006). Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Kelly, F. L., Harrison, A. J., Connor, L., Matson, R., Wightman, G., Morrissey, E. et al. (2010). Sampling fish for the Water Framework Directive—Summary report 2009. Central and Regional Fisheries Boards report, Swords, p. 157.
- Kelly, F.L., Matson, R., Connor, L., Feeney, R., Morrissey, E., Wogerbauer, C. and Rocks, K. (2012) Water Framework Directive Fish Stock Survey of Rivers in the Eastern River Basin District. Inland Fisheries Ireland, Swords Business Campus, Swords, Co. Dublin, Ireland.
- Kelly-Quinn, M. & Regan, E.C. (2012) Ireland Red List No. 7: Mayflies (Ephemeroptera). National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.
- King, J. (2018) 'Having to mitigate for lamprey – something you might not have reckoned on.' Inland Fisheries Ireland. Irish Conference & AGM 2018 Making Mitigation Work Red Cow Moran Hotel, Dublin. Available at https://cieem.net/wp-content/uploads/2019/03/James-King_Having-to-mitigate-for-lamprey-%E2%80%93-something-you-might-not-have-reckoned-on.pdf
- King, J., Marnell, F., Kingston, N., Rosell, R., Roche, W.K. & Cassidy, D. (2011) Ireland Red List No. 5: Fish, Amphibians & Reptiles. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland

Lockhart, N., Hodgetts, N. & Holyoak, D. (2012) Ireland Red List No.8: Bryophytes. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Macklin, R., Brazier, B., Sleeman, P. (2019). Dublin City otter survey. Report prepared by Triturus Environmental Ltd. for Dublin City Council as an action of the Dublin City Biodiversity Action Plan 2015- 2020.

Marnell, F. (2002). The distribution and habitat of the common lizard, *Lacerta viviparina*, in Ireland. Bulletin of the Irish Biogeographical Society. 26: 75-82.

Marnell, F., Looney, D. & Lawton, C. (2019). Ireland Red List No. 12: Terrestrial Mammals. National Parks and Wildlife Service, Department of the Culture, Heritage and the Gaeltacht, Dublin, Ireland.

Marnell, F., Kelleher, C. & Mullen, E. (2022) *Bat mitigation guidelines for Ireland* v2. Irish Wildlife Manuals, No. 134. National Parks and Wildlife Service, Department of Housing, Local Government and Heritage)

Matson, R., Delanty, K., Shephard, S., Coghlan, B., & Kelly, F. (2018). Moving from multiple pass depletion to single pass timed electrofishing for fish community assessment in wadeable streams. Fisheries Research, 198, 99-108. Merne, O.J., Madden, B. (2000). Breeding seabirds of Ireland's Eye, County Dublin. Irish Birds 6:495-506.

Mitchell-Jones, A.J. and McLeish, A.P. (1999). The Bat Workers' Manual.

Natural England (2016). The Ecological Effects of Air Pollution from Road Transport: An Updated Review.

NBDC (2020). National Biodiversity Data Centre Database [Online] Available from <https://maps.biodiversityireland.ie/Map>

NBDC (2021). All-Ireland Pollinator Plan 2021-2025, National Biodiversity Data Centre Series No. 25, Waterford.

Nelson, B., Ronayne, C. & Thompson, R. (2011) Ireland Red List No.6: Damselflies & Dragonflies (Odonata). National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

NPWS (2007a). Circular Letter NPWS 2/07 Guidance on compliance with Regulation 23 of the Habitats Regulations 1997 – strict protection of certain species / applications for derogation licences.

NPWS (2007b). Circular Letter PD 2/07 and NPWS 1/07 Compliance Conditions in respect of Developments requiring (1) Environmental Impact Assessment (EIA); or (2) having potential impacts on Natura 2000 sites.

NPWS (2010). Circular NPW 1/10 & PSSP 2/10 Appropriate Assessment under Article 6 of the Habitats Directive: Guidance for Planning Authorities.

NPWS (2012a). Article 12 Spatial Data [Online] Available from <https://www.npws.ie/maps-and-data/habitat-and-species-data/article-12-data>

NPWS (2012b). Conservation Objectives: Baldoyle Bay SAC 000199. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2013a). Conservation Objectives: South Dublin Bay SAC 000210. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2013b). Conservation Objectives: North Dublin Bay SAC 000206. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2013c). Conservation Objectives: Malahide Estuary SAC 000205. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

- NPWS (2013d). Conservation Objectives: Rogerstown Estuary SAC 000208. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2013e). Conservation Objectives: Rockabill to Dalkey Island SAC 003000. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2013f). Conservation Objectives: Lambay Island SAC 000204. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2013g). Conservation Objectives: Malahide Estuary SPA 004025. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2013h). Conservation Objectives: Baldoyle Bay SPA 004016. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2013i). Conservation Objectives: Rogerstown Estuary SPA 004015. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2013j). Conservation Objectives: Rockabill SPA 004014. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2015a). Conservation Objectives: South Dublin Bay and River Tolka Estuary SPA 004024. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2015b). Conservation Objectives: North Bull Island SPA 004006. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2016). Conservation Objectives: Howth Head SAC 000202. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.
- NPWS (2017a). Conservation Objectives: Wicklow Mountains SAC 002122. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.
- NPWS (2017b). Conservation Objectives: Ireland's Eye SAC 002193. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.
- NPWS (2018a). Baldoyle Bay SAC 000199. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2018b). Howth Head SAC 000202. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2018c). Glenasmole Valley SAC 001209. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2018d). Wicklow Mountains SAC 002122. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2019a). The Status of EU Protected Habitats and Species in Ireland. Volume 1: Summary Overview. Unpublished NPWS report.
- NPWS (2019b). The Status of EU Protected Habitats and Species in Ireland. Volume 2: Habitat Assessments. Unpublished NPWS report.
- NPWS (2019c). The Status of EU Protected Habitats and Species in Ireland. Volume 3: Species Assessments. Unpublished NPWS report.

- NPWS (2019d). Rogerstown Estuary SAC 000208. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2019e). Rockabill to Dalkey Island SAC 003000. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2019f). Lambay Island SAC 000204. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020a). South Dublin Bay SAC 000210. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020b). North Dublin Bay SAC 000206. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020c). Malahide Estuary SAC 000205. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020d). Ireland's Eye SAC 002193. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020e). Sandymount Strand/Tolka Estuary SPA 004024. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020f). North Bull Island SPA 0004006. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020g). Malahide Estuary SPA 004025. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020h). Baldoyle Bay SPA 0004016. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020i). Rogerstown Estuary SPA 0004015. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020j). Wicklow Mountains SPA 0004040. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020k). Ireland's Eye SPA 0004117. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020l). Howth Head Coast SPA 0004113. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020m). Dalkey Islands SPA 0004172. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020n). Skerries Islands SPA 0004122. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020o). Lambay Island SPA 0004069. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.
- NPWS (2020p). Rockabill SPA 004014. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2020q). The Murrrough SPA 0004186. Natura 2000 – Standard Data Form. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

NPWS (2021a). Online data available on European sites and on Natural Heritage Areas (NHAs) or proposed Natural Heritage Areas (pNHAs) as held by the National Parks and Wildlife Service (NPWS). Available online at <www.npws.ie/protectedsites/> and <<http://webgis.npws.ie/npwsviewer/>>.

NPWS (2021b). 'Protected species and habitats datasets returned after data request'

NPWS (2021c). Conservation objectives for Glenasmole Valley SAC [001209]. Generic Version 8.0. Department of Housing, Local Government and Heritage.

NPWS (2021d). Conservation objectives for Ireland's Eye SPA [004117]. Generic Version 8.0. Department of Housing, Local Government and Heritage.

NPWS (2022a). Conservation objectives for Wicklow Mountains SPA [004040]. Generic Version 8.0. Department of Housing, Local Government and Heritage.

NPWS (2022b). Conservation objectives for Howth Head Coast SPA [004113]. Generic Version 8.0. Department of Housing, Local Government and Heritage.

NPWS (2022c). Conservation objectives for Dalkey Islands SPA [004172]. Generic Version 8.0. Department of Housing, Local Government and Heritage.

NPWS (2022d). Conservation objectives for Skerries Islands SPA [004122]. Generic Version 8.0. Department of Housing, Local Government and Heritage.

NPWS (2022e). Conservation objectives for Lambay Island SPA [004069]. Generic Version 8.0. Department of Housing, Local Government and Heritage.

NPWS (2022f). Conservation objectives for The Murrrough SPA [004186]. Generic Version 8.0. Department of Housing, Local Government and Heritage.

NRA (2005a). Guidelines for the Crossing of Watercourses During the Construction of National Road Schemes.

NRA (2005b). Guidelines for the Treatment of Badgers Prior to the Construction of National Road Schemes.

NRA (2006a). Best Practice Guidelines for the Conservation of Bats in the Planning of National Road Schemes.

NRA (2006b). Guidelines for the Treatment of Otters Prior to the Construction of National Road Schemes.

NRA (2008a). Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes.

NRA (2008b). Environmental Impact Assessment of National Road Schemes – A Practical Guide. National Roads Authority.

NRA (2009). Guidelines for Assessment of Ecological Impacts of National Road Schemes.

NRA (2011). Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes. Revision 1, 8th May 2011.

Öckinger, E., Schweiger, O., Crist, T.O. et al. (2010) Life-history traits predict species responses to habitat area and isolation: a cross continental synthesis. Ecology Letters. 13:969-979..
https://ec.europa.eu/environment/integration/research/newsalert/pdf/214na5_en.pdf

O'Grady, M.F. (2006) Channels and Challenges: Enhancing Salmonid Rivers. Irish Freshwater Fisheries. Ecology and Management Series. Number 4. Central Fisheries Board, Dublin.

- Ó Néill, L., Veldhuizen, T., de Jongh, A., Rochford, J. (2009) Ranging behaviour and socio-biology of Eurasian otters (*Lutra lutra*) on lowland mesotrophic river systems. *European Journal of Wildlife Research*: 55: 363-370
- Peay, S. (2003). Monitoring the white-clawed crayfish *Austropotamobius pallipes*. Conserving Natura 2000 Rivers Monitoring Series No. 1, English Nature, Peterborough.
- Regan, E.C., Nelson, B., Aldwell, B., Bertrand, C., Bond, K., Harding, J., Nash, D., Nixon, D., Wilson, C.J. (2010). Ireland Red List No. 4 – Butterflies. Department of the Environment, Heritage, and Local Government, Ireland.
- Reid, N., Hayden, B., Lundy, M.G., Pietravalle, S., McDonald, R.A. & Montgomery, W.I. (2013) National Otter Survey of Ireland 2010/12. Irish Wildlife Manuals No. 76. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland. Rich, C., Longcore, T. (2005). Ecological Consequences of Artificial Night lighting. Island Press.
- Reynolds, J.D., O'Connor, W., O'Keeffe, C. & Lynn, D. (2010) A technical manual for monitoring white-clawed crayfish *Austropotamobius pallipes* in Irish lakes. Irish Wildlife Manuals, No 45, National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin
- Roos, A., Loy, A., de Silva, P., Hajkova, P. & Zemanová, B. 2015. *Lutra lutra*. The IUCN Red List of Threatened Species 2015: e.T12419A21935287. <https://dx.doi.org/10.2305/IUCN.UK.2015-2.RLTS.T12419A21935287.en>.
- Russ, J. (2012). British Bat Calls: A Guide to Species Identification. Pelagic Publishing, Exeter.
- Scott Cawley Ltd. (2017). Natura Impact Statement – Information for Stage 2 Appropriate Assessment for the Proposed Residential Development St. Paul's College, Sybill Hill, Raheny, Dublin 5.
- Scott Cawley Ltd.(2022a). BusConnects Dublin- Ballymun/ Finglas to City Centre Core Bus Corridor Scheme - AA Screening Report
- Scott Cawley Ltd. (2022b). BusConnects Dublin- Ballymun/ Finglas to City Centre Core Bus Corridor Scheme - Nature Impact Statement
- Shiel, C.B., Shiel, R.E., Fairley, J.S. (1999). Seasonal changes in the foraging behaviour of Leisler's bats (*Nyctalus leisleri*) as revealed by radio-telemetry. *Journal of Zoology*: 249: 347-358.
- Smith, G.F., O'Donoghue, P., O'Hora, K. & Delaney, E. (2011). Best Practice Guidance for Habitat Survey and Mapping. The Heritage Council Church Lane, Kilkenny, Ireland.
- Stace, C. A. (2019). New Flora of the British Isles. 4th Edition. C&M Floristics.
- Svensson, L., Mullarney, K., Zetterstrom, D. (2010). Collins Bird Guide 2nd Ed. 2009 HarperCollins Publishers, London.
- TCD (2017). Trinity Campus Pollinator Plan (CPP). Available [Online] <https://naturalscience.tcd.ie/pollinator/conserv.php>
- The Central and Regional Fisheries Board (2009) Tolka Estuary. Sampling Fish for the Water Framework Directive – Transitional Waters 2008. Available at <http://www.wfdfish.ie/wp-content/uploads/2009/09/Tolka.pdf>
- Thomas, C. (2016), Urban Walk: The Wildlife of the Royal Canal. Dublin InQuirer. Available at <https://www.dublininquirer.com/2016/06/22/urban-walk-the-wildlife-of-the-toaly-canal>
- Tierney, N., Whelan, R., Boland, H. & Crowe, O. (2017). The Dublin Bay Birds Project Synthesis 2013-2016. BirdWatch Ireland, Kilcoole, Co. Wicklow.
- TII (2020a). The Management of Invasive Alien Plant Species on National Roads - Technical Guidance. Transport Infrastructure Ireland Publications.

TII (2020b). The Management of Invasive Alien Plant Species on National Roads – Standard.

Tong, Z., R.W. Baldauf, V. Isakov, P. Deshmukh, and K.M. Zhang (2016). Roadside vegetation barrier designs to mitigate near-road air pollution impacts. *Science of the Total Environment* 541: 920–927.

Triturus Environmental Ltd. (2020). Aquatic baseline report for the BusConnects project, Dublin City.

UKHA (2001a). Design Manual for Roads and Bridges: Volume 10: Environmental Design and Management. Section 4: Nature Conservation: Part 3, HA 80/99; Nature Conservation Advice in Relation to Bats. The Highways Agency.

UKHA (2001b). Design Manual for Roads and Bridges: Volume 10: Environmental Design and Management. Section 4: Nature Conservation: Part 4, HA 81/99; Nature Conservation Advice in Relation to Otters. The Highways Agency.

UKHA (2005). Design Manual for Roads and Bridges: Volume 10: Environmental Design and Management. Section 4: Nature Conservation: Part 7, HA 116/05; Nature Conservation Advice in Relation to Reptiles and Roads. The Highways Agency.

Wright, M., Goodman, P., Cameron, T. (2010). Exploring Behavioural Responses of Shorebirds to Impulse Noise. *Wildfowl* (2010) 60: 150-167.

Wyse Jackson, M., FitzPatrick, Ú., Cole, E., Jebb, M., McFerran, D., Sheehy Skeffington, M. & Wright, M. (2016). Ireland Red List No. 10: Vascular Plants. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs, Dublin, Ireland.

Directives and Legislation

Council Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for the Community action in the field of water policy. (The Water Framework Directive).

Council Directive 2009/147/EC of the European Parliament and of the Council of 30 November 2009 on the conservation of wild birds (The Birds Directive).

Council Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014, amending Directive 2011/92/EU of the European Parliament and the Council of 13 December 2011 on the assessment of the impacts of certain public and private projects on the environment.

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora (The Habitats Directive).

Inland Fisheries Acts 1959 to 2017 (Amendment Act (2017)). Updated to 2017 by virtue of Inland Fisheries (Amendment) Act 2017, s. 5(3)).

S.I. No. 356/2015 - Flora (Protection) Order, 2015.

S.I. No. 365/2021 - Planning and Development (Amendment) Act 2021 (Commencement) Order 2021 (S.I. No. 365 of 2021)

S.I. No. 477/2011 - European Communities (Birds and Natural Habitats) Regulations 2011.

Wildlife Acts 1976 – 2021. As updated to 2021 by virtue of S.I. No. 302 of 2021 - Heritage (Transfer of Departmental Administration and Ministerial Functions) Order 2021