5.1 INTRODUCTION

This Environmental Report has been prepared with regard to the EIA Directive as well as best practice methodology from the EPA, under which, the analysis of impacts to biodiversity is an essential component of the EIA process, and so is a required chapter in any EIAR.

Under Article 6(3) of the Habitats Directive an 'appropriate assessment' of projects must be carried out to determine if significant effects are likely to arise to the integrity of Natura 2000 sites. As part of the preparation phase for this planning application and EIAR, an Appropriate Assessment Screening Report was prepared. This Report concluded that significant effects to the Boyne Coast and Estuary SAC could not be ruled out. Consequently, a stage 2 Appropriate Assessment has been undertaken and a Natural Impact Statement accompanies this application under separate cover. Both of these assessments were undertaken by the author of this chapter of the EIAR to ensure a coordinated approach.

5.2 STUDY METHODOLOGY

The assessment was carried out in accordance with the following best practice methodology: 'Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland' by the Institute of Ecology and Environmental Management (IEEM, 2016); 'Guidelines on the information to be contained in Environmental Impact Assessment Reports by the Environmental Protection Agency (EPA, 2016).

A site visit was carried out on the 24th of May 2018. The site was surveyed in accordance with the Heritage Council's Best Practice Guidance for Habitat Survey and Mapping (Smith et al., 2010). Habitats were identified in accordance with Fossitt's Guide to Habitats in Ireland (Fossitt, 2000). Species abundance was determined using the DAFOR scale (D = Dominant; A = Abundant; F = Frequent; O = Occasional; R = Rare). This is a subjective form of habitat description commonly used in conjunction with habitat classifications. Sample digital photos were also taken. Data were then uploaded to the ArcView 9.2 GIS software suite.

The nomenclature for vascular plants is taken from The New Flora of the British Isles (Stace, 2010) and for mosses and liverworts A Checklist and Census Catalogue of British and Irish Bryophytes (Hill et al., 2009).

May lies within the optimal survey period for general habitat surveys (Smith et al., 2010). It was thus possible to classify all habitats on the site to Fossitt level 3. It is also within the optimal season for breeding birds. It is suboptimal for larger mammals as field signs (tracks, trails etc.) can be obscured by vegetation.

5.3 EXISTING RECEIVING ENVIRONMENT

5.3.1 Zone of Influence

Best practice guidance suggests that an initial zone of influence be set at a radius of 2km for non-linear projects (IEA, 1995). However, some impacts are not limited to this distance and so sensitive receptors further from the project footprint may need to be considered as this assessment progresses. This initial radius is shown in figure 1.

There are a number of designations for nature conservation in Ireland including National Park, National Nature Reserve, RAMSAR site, UNESCO Biosphere reserves, Special Protection Areas (SPA – Birds Directive), Special Areas of Conservation (SAC – Habitats Directive); and Natural Heritage Areas. The mechanism for these designations is through national or international legislation. Proposed NHAs (pNHA) are areas that have yet to gain full legislative protection. They are generally protected through the relevant County Development Plan. There is no system in Ireland for the designation of sites at a local, or county level. The following areas were found to be located within the zone of influence of the application site:

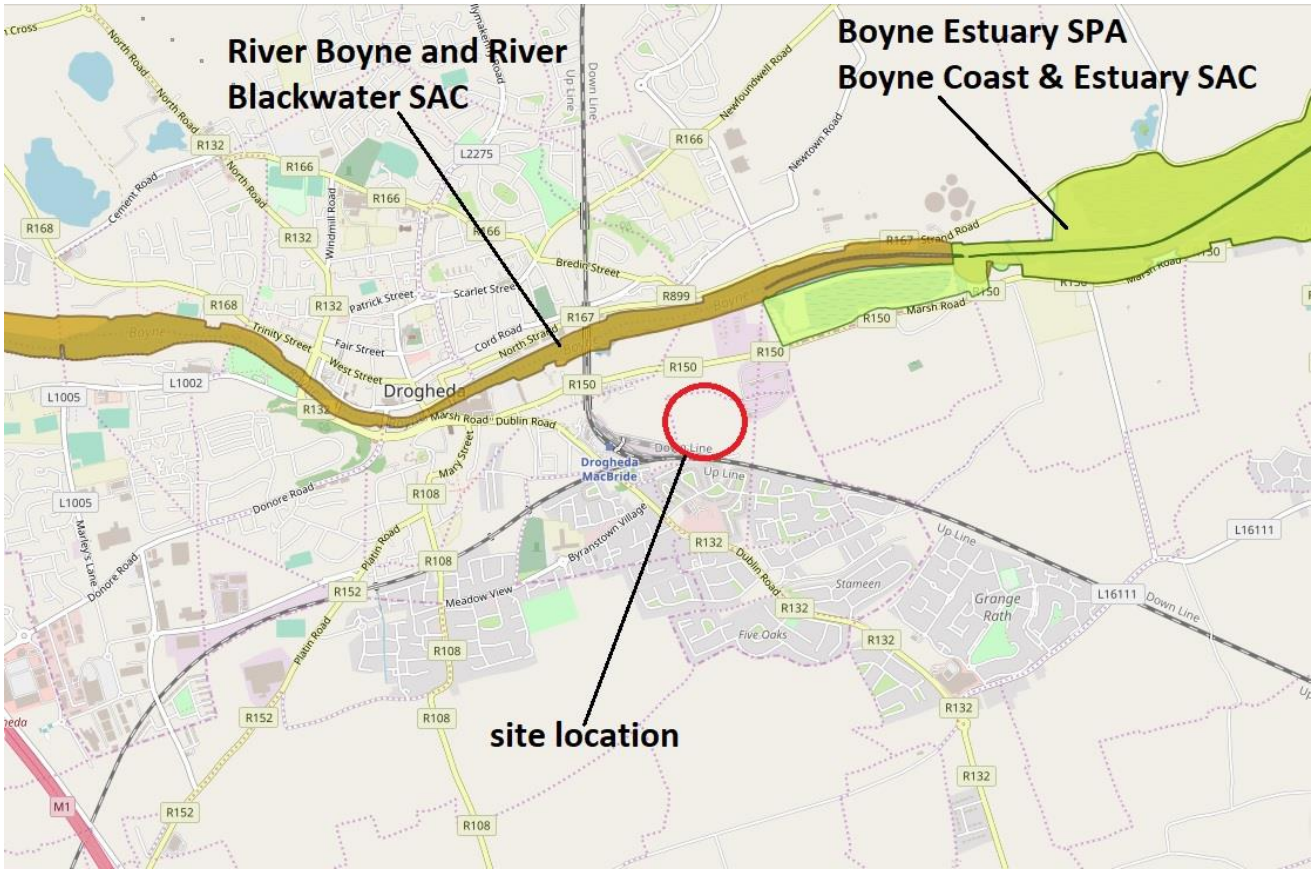

Figure 1 – Approximate 2km radius of proposed site (red circle) showing areas designated for nature conservation (from www.npws.ie).

Boyne Estuary SPA (site code: 4080)

The tidal estuary of the Boyne is located to the east of the town of Drogheda. A site synopsis report states that it is home to ten birds with a population of national importance (Shelduck *Tadorna tadorna*, Oystercatcher *Haematopus ostralegus*, Golden plover *Pluvialis apricaria*, Grey plover *Pluvialis squatarola*, Lapwing *Vanellus vanellus*, Knot, Sanderling, Black-tailed godwit *Limosa limosa*, Redshank *Tringa totanus* and Turnstone *Arenaria interpres*). Two of these species are listed on Annex I of the Birds Directive (Golden plover and Black-tailed godwit). An additional Annex I species, Little Tern, has been re-established through a conservation programme at Baltray.

Table 1 – Features of interest for the Boyne Coast & Estuary SPA (EU code in square parenthesis)

Oystercatcher (*Haematopus ostralegus*) [A130]
Golden Plover (Pluvialis apricaria) [A140]
Grey Plover (*Pluvialis squatarola*) [A140]
Knot (*Calidris canutus*) [A143]
Sanderling (*Calidris alba*) [A144]
Black-tailed Godwit (Limosa limosa) [A156]
Redshank (*Tringa totanus*) [A162]
Turnstone (Arenaria interpres) [A169]
Little Tern (Sterna albifrons) [A195]
Lapwing (Vanellus vanellus) [A142]
Wetlands & Waterbirds [A999]

- **Grey Plover.** These birds do not breed in Ireland but winter throughout coastal estuaries and wetlands. Its population and distribution is considered to be stable
- **Redshank.** Once common breeders throughout the peatlands and wet grasslands of the midlands Redshanks have undergone a 55% decline in distribution in the past 40 years. Agricultural intensification, drainage of wetlands and predation are the chief drivers of this change.
- **Lapwing.** Although still one of the most widespread of the breeding waders Lapwing populations have declined by over 50% in the past 40 years. This has been driven by changes in agricultural practices and possibly increased predation.
- **Black-tailed Godwit.** Breeding in Iceland these waders winter in selected sites around the Irish coast, but predominantly to the east and southern halves. Their range here has increased substantially of late.
- **Turnstone.** This winter visitor to Irish coasts favours sandy beaches, estuaries and rocky shores. It is found throughout the island but changes may be occurring due to climate change.
- **Little Tern.** Breeding colonies have declined in nearly all scattered Irish nesting localities over the past 40 years. On mainland colonies wardening, to prevent predation effects, is now crucial for long-term survival.

Boyne Coast and Estuary SAC (site code: 1957)

This SAC encompasses the tidal sections of the River Boyne, as far upriver as Drogheda. Its habitat value is centred on coastal and intertidal areas and includes salt marshes and sand dunes in various successional stages. A number of scarce or notable plants have been recorded from the dunes including the Wild Clary *Salvia verbenaca,* which is listed on the Red Data Book (Curtis & McGough, 1988).

Table 2 – Qualifying interests of the Boyne Coast and Estuary SAC

Aspect	Level of Protection
Fixed coastal dunes with herbaceous vegetation	Habitats Directive Annex I priority
Embryonic shifting dunes	Habitats Directive Annex I
Shifting dunes with *Ammophila arenaria* (Marram grass)	
Mediterranean salt meadows	
Atlantic salt meadows	
Estuaries	
Mudflats and sandflats not covered by seawater at low tide	
Salicornia and other annuals colonising mud and sand	

- **Embryonic shifting dunes (2110).** As their name suggests these sand structures represent the start of a sand dune's life. Perhaps only a meter high they are a transient habitat, vulnerable to inundation by the sea, or developing further into white dunes with Marram Grass. They are threatened by recreational uses, coastal defences, trampling and erosion.
- **Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) (2120).** These are the second stage in dune formation and depend upon the stabilising effects of Marram Grass. The presence of the grass traps additional sand, thus growing the dunes. They are threatened by erosion, climate change, coastal flooding and built development.
- **Fixed coastal dunes with herbaceous vegetation (grey dunes) (2130 – priority habitat).** These are more stable dune systems, typically located on the landward side of the mobile dunes. They have a more or less permanent, and complete covering of vegetation, the quality of which depends on local hydrology and grazing regimes. They are the most endangered of the dune habitat types and are under pressure from built developments such as golf courses and caravan parks, over-grazing, under-grazing and invasive species.
- **Atlantic and Mediterranean salt meadows (1330 & 1410)**: these are intertidal habitats that differ somewhat in their vegetation composition. They are dynamic habitats that depend upon processes of erosion, sedimentation and colonisation by a typical suite of salt-tolerant organisms. The main pressures are invasion by the non-native *Spartina anglica* and overgrazing by cattle and sheep.
- **Estuary (1130)**: This is the portion of a river that is influenced by the tide but retaining a significant freshwater influence. Substrates can range from rocks and boulders, to expanses of fine mud and sand.

They are an important resource for birds and other fauna and many estuaries have twin designations (i.e. both SAC and SPA). It considered that the majority of estuary habitat is in good condition however approximately a quarter is negatively affected by excess nutrient input and damaging fishing practices.

- **Tidal mudflats (1140)**. This is an intertidal habitat characterised by fine silt and sediment. Most of the area in Ireland is of favourable status however water quality and fishing activity, including aquaculture, are negatively affecting some areas.
- **Salicornia mudflats (1310)**: This is a pioneer saltmarsh community and so is associated with intertidal areas. It is dependent upon a supply of fresh, bare mud and can be promoted by damage to other salt marsh habitats. It is chiefly threatened by the advance of the alien invasive Cordgrass *Spartina anglica.* Erosion can be destructive but in many cases this is a natural process.

The Boyne Coast and Estuary pNHA is largely superseded by the SAC and SPA designations. Only a small area of coastal habitat, to the south of Mornington, is excluded from these areas. The pNHA designation is not recognised in law so it is considered that the SAC/SPA provides a more robust level of protection.

Description of structure and functional relationships:

Estuaries are among the most productive habitats on earth as great quantities of sediment and nutrients are deposited from their feeding rivers. The abundance of invertebrate life living within these sediments provides resources for large flocks of wetland and wading birds, some of which use estuaries on a seasonal basis. Dynamic coastal habitats meanwhile are important in buffering inland areas from storms as well as potential future impacts from climate change (Little, 2000).

River Boyne and River Blackwater SAC (site codes: 2299)

The river Boyne and river Blackwater drain most of county Meath. They are important salmonid rivers and are home to a range of aquatic and riparian species. The reasons why these rivers are an SAC are set out in the site's 'qualifying interests' and these are given in table 3.

Table 3 – Qualifying interests of the River Blackwater and River Boyne SAC

Aspect	**Level of Protection**
Alluvial forest (code: 91E0)	Habitats Directive Annex I priority
Alkaline fens (code: 7230)	Habitats Directive Annex I
Atlantic salmon *Salmo salar* (code: 1106)	Habitats Directive Annex II
River lamprey *Lampetra fluviatilis* (code: 1099)	
Otter *Lutra lutra* (code: 1355)	

The conservation status of these features of interest have not been assessed at the level of the SAC. Habitats and species designated under the Habitats Directive have been assessed as part of Ireland's commitments under Article 17 of that Directive. These assessments are at a national scale only. Table 4 gives the assessment of those features of relevance to the River Boyne and River Blackwater SAC (NPWS, 2013b & c). The conservation status of the Otter, River Lamprey and Atlantic Salmon have been assessed as near threatened, least concern and vulnerable respectively (Marnell et al., 2009; King et al., 2011).

Table 4 – Assessment of features of interest of the River Boyne and River Blackwater SAC

Alluvial forest (code: 91E0)	Bad
Alkaline fens (code: 7230)	Bad
Atlantic salmon *Salmo salar* (code: 1106)	Intermediate
River lamprey *Lampetra fluviatilis* (code: 1099)	Good
Otter *Lutra lutra* (code: 1355)	Good

Alkaline Fens: Threats of 'high importance' are groundwater abstractions, land reclamation, diffuse groundwater pollution, land abandonment/under-grazing. These fen systems are often a complex mosaic of habitats, with tall sedge beds, reedbeds, wet grasslands, springs and open-water often co-occurring at a given fen site. Their integrity is reliant upon a stable, high water table; calcareous/low-nutrient water supply; and controlled mowing and/or grazing.

Alluvial Wet Woodland: This is a native woodland type that occurs on heavy soils, periodically inundated by river water but which are otherwise well drained an aerated. The main pressures are identified as alien invasive species, undergrazing and overgrazing. Pollution from agricultural land may also be significant.

River lamprey: This species spends its entire life cycle in freshwater and is considerably smaller than the larger, and more threatened Sea lamprey. As juveniles they are indistinguishable from Brook lamprey at the species level and are only differentiated by their size at adults. Since surveys are carried out on the juvenile life stage these two species are jointly assessed. Although threatened by pollution, along with all aquatic life, they are assessed as being of 'good' status.

Atlantic salmon: This once abundant fish has suffered a dramatic decline in recent decades. On land they are threatened by pollution and barriers to migration while at sea mortality may occur through industrial fisheries, parasites from aquaculture operations and climate change. The Habitats Directive only protects the salmon in its freshwater habitat and for some SACs specific conservation objectives have been set for water quality. Salmon will only spawn in clean, sediment-free beds of gravel.

Otter: This aquatic mammal lives its entire life in and close to wet places, including rivers, lakes and coastal areas. They will feed on a wide variety of prey items. Despite local threats from severe pollution incidents and illegal fishing, its population is considered stable and healthy, and so is assessed as being of 'good' status.

Description of structure and functional relationships

Rivers are dynamic ecosystems that are a function of numerous factors such as climate, geology and land use, all of which determine the water quality and quantity at any given time. Processes such as erosion and deposition ensure that even the course of the river can change over time. The function of these fully- or semi-aquatic habitats depends upon maintaining water volume, free movement of key species, water chemistry to which the particular species are adapted as well as the structure of riparian habitats and, crucially, its floodplain (Giller & Malmqvist, 1998). Threats to river systems in Ireland include eutrophication, overgrazing, excessive fertilisation, afforestation and the introduction of alien invasive species (NPWS, 2008).

The NPWS web site (*www.npws.ie*) contains a mapping tool that indicates historic records of legally protected species within a selected Ordnance Survey (OS) 10km grid square. The Newtown site is located within the square O17 and four species of protected animal and flowering plant are highlighted. These species are detailed in Table 5. It must be noted that this list cannot be seen as exhaustive as suitable habitat may be available for other important and protected species. In summary, it can be seen that of the four species two records remain current.

Table 5 – Known records for protected species within the O17 10km square

Species	Habitat[1] [2]	Current status[3]
Galeopsis angustifolia Red Hemp-nettle	Calcareous gravels	Record pre-1970
Hordeum secalinum Meadow Barley	Upper parts of brackish marshes, chiefly near the sea	Record pre-1970
Lutra lutra Otter	Wetlands, rivers and coastal zone	Present
Phoca vitulina Harbour Seal	Coastal and marine habitats	Present

Water quality in rivers and estuaries is monitored on an on-going basis by the Environmental Protection Agency (EPA). They assess the pollution status of a stretch of water by analysing the invertebrates living in the substrate as different species show varying sensitivities to pollution. They arrive at a 'Q-Value' where Q1 = grossly polluted and Q5 = pristine quality (Toner et al., 2005). The Newtown site is not within the catchment of any significant river. Small water courses in this vicinity join the estuary of the River Boyne to the north. There are no EPA monitoring points along the Stagrennan Stream – the nearest water course to the subject site shown on EPA maps. The estuary of the Boyne has been assessed as of 'intermediate' water quality and is 'moderate' for the most recent WFD monitoring period (2010-2015). These data are taken from the mapping tool on *www.epa.ie*.

[1] Parnell et al., 2012
[2] Hayden & Harrington, 2001
[3] www.bsbi.org / www.biodiversityireland.ie

5.3.2 Stakeholder Consultation

The Development Applications Unit of the Department of Culture, Heritage and the Gaeltacht was contacted for nature conservation observations (reference GPre00134/2008). A response to this was received on July 20th 2018 (reference GPre00134/2018). This contain general requirements on the preparation of AA Screening and did not provide comments specific to the subject lands.

5.3.3 Site Survey

Aerial photography from the OSI and historic mapping shows that this area has been occupied by agricultural land since historical times. The main Dublin to Belfast railway line and a public road run to the south, the municipal wastewater treatment plant for Drogheda is found to the north-east while the remaining land is open and agricultural in nature. All land surrounding the development site is either developed or zoned for development.

5.3.3.1 Flora

The subject site comprises a series of two large fields which are in agricultural production and are **arable crops – BC1**. **Hedgerow – WL1** field boundaries are found throughout. They are composed of Hawthorn Crataegus monogyna, Ash Fraxinus excelsior with Ivy Hedera helix and Brambles Rubus fruticosus agg, along with some Sycamore Acer pseudoplatanus and Elder Sambucus nigra. A taller **treeline – WL2** can be found along the northern boundary of the western field. This is composed of large Beech Fagus sylvatica with Ash, Hawthorn and Horse Chestnut Aesculus hippocastanum. A broad **drainage ditch – FW4** can be found to the south and accompanies a hedgerow before veering into the centre of the eastern field**.** All of these boundaries are marked on original OSI maps from the early 1800s while the boundaries to the north and west are townland boundaries and so are likely to be of even greater age. Following guidance from the Heritage Council (Foulkes et al., 2013) these features are of 'higher significance' due to their age and structure. Investigations by the project engineers have shown that the ditch is not connected to any larger water course and has no point of outfall.

To the south-east a lack of agricultural management has resulted in the growth of **scrub – WS1** and this is mostly Brambles and Blackthorn Prunus spinosa with some Grey Willow Salix cinerea. A small length of treeline to the south-east borders a house and is composed of the non-native (and low biodiversity value) Leyland Cypress Cuprocyparis leylandii.

There are no habitats which are examples of those listed in Annex II of the Habitats Directive. There are no plant species which are listed as alien invasive on Schedule 3 of SI No. 477 of 2011. Habitats are mostly of low ecological value while boundary hedgerows and treelines can be considered to be of high local value.

5.3.3.2 Fauna

The site survey included incidental sightings or proxy signs (prints, scats etc.) of faunal activity, while the presence of certain species can be concluded where there is suitable habitat within the known range of that species. Table 6 details those mammals that are protected under national or international legislation in Ireland. Cells are greyed out where suitable habitat is not present, or species are outside the range of the study area.

Table 6 – Protected mammals in Ireland and their known status within the O17 10km square. Those that are greyed out indicate either that suitable habitat is not present or that there are no records of the species from the National Biodiversity Date Centre 10km.

Species	Level of Protection	Habitat[4]	Red List Status[5]
Otter Lutra lutra	Annex II & IV Habitats Directive; Wildlife (Amendment) Act, 2000	Rivers and wetlands	Near Threatened
Lesser horseshoe bat Rhinolophus hipposideros		Disused, undisturbed old buildings, caves and mines	Least Concern
Grey seal Halichoerus grypus	Annex II & V Habitats Directive; Wildlife (Amendment) Act, 2000	Coastal habitats	-
Common seal Phocaena phocaena			-
Whiskered bat Myotis mystacinus	Annex IV Habitats Directive; Wildlife (Amendment) Act, 2000	Gardens, parks and riparian habitats	Least Concern
Natterer's bat Myotis nattereri		Woodland	Least Concern
Leisler's bat Nyctalus leisleri		Open areas roosting in attics	Near Threatened
Brown long-eared bat Plecotus auritus		Woodland	Least Concern
Common pipistrelle Pipistrellus pipistrellus		Farmland, woodland and urban areas	Least Concern
Soprano pipistrelle Pipistrellus pygmaeus		Rivers, lakes & riparian woodland	Least Concern
Daubenton's bat Myotis daubentonii		Woodlands and bridges associated with open water	Least Concern
Nathusius' pipistrelle Pipistrellus nathusii		Parkland, mixed and pine forests, riparian habitats	Least Concern

[4] Harris & Yalden, 2008
[5] Marnell et al., 2009

Irish hare Lepus timidus hibernicus	Annex V Habitats Directive; Wildlife (Amendment) Act, 2000	Wide range of habitats	Least Concern
Pine Marten Martes martes		Broad-leaved and coniferous forest	Least Concern
Hedgehog Erinaceus europaeus	Wildlife (Amendment) Act, 2000	Woodlands and hedgerows	Least Concern
Pygmy shrew Sorex minutus		Woodlands, heathland, and wetlands	Least Concern
Red squirrel Sciurus vulgaris		Woodlands	Near Threatened
Irish stoat Mustela erminea hibernica		Wide range of habitats	Least Concern
Badger Meles meles		Farmland, woodland and urban areas	Least Concern
Red deer Cervus elaphus		Woodland and open moorland	Least Concern
Fallow deer Dama dama		Mixed woodland but feeding in open habitat	Least Concern
Sika deer Cervus nippon		Coniferous woodland and adjacent heaths	-

There was no evidence of Badger activity on the site. No sett was recorded although there are records of a Badger activity from this vicinity from the National Biodiversity Data Centre. Otter is recorded from along the Boyne Estuary and suitable habitat on this site is not available. Although widespread, there was no evidence that Irish Hare is present. Woodland habitat is not present to support Deer, Pine Marten or Red Squirrel. Small mammals such as the Irish Stoat, Hedgehog and Pygmy Shrew are considered more or less ubiquitous in the Irish countryside, including on disused land in urban areas (Lysaght & Marnell, 2016). No direct evidence of any mammal was recorded. Rabbit *Oryctolagus cuniculus* and Fox *Vulpes vulpes* are common in Meath along with Brown Rat *Rattus norvegicus*, House Mouse *Mus domesticus* and Field Mouse *Apodemus sylvaticus*. These species are not protected.

Features on the site may be suitable for foraging bats, particularly along hedgerows and treelines (Hundt, 2012). A detector-based survey has not been carried out. A visual inspection was carried out by Brian Keeley of Wildlife Surveys Ireland on February 14th 2019 and this concluded that larger Beech trees in the treeline may contain cavities suitable for roosting. These trees are not to be directly affected by the project. A full detector-based survey was then carried out in May 2019. This found no evidence of bat roosting on the site while three species, Leisler's Bat, Common & Soprano Pipistrelle were noted to be feeding along hedgerows and treelines.

May lies within the optimal season for surveying breeding birds. The following birds were recorded from the site: Blackbird *Turdus merula*, Wren *Troglodytes troglodytes*, Starling *Sturnus vulgaris*, Chaffinch F*ringilla coelobs*, Blackcap *Sylvia atricapilla*, Chiffchafff *Phylloscopus collybita*, Blue Tit *Parus caeruleus* and Dunnock *Prunella modularis*. These species are all of low conservation concern/green list (Colhoun & Cummins, 2013). Breeding habitat in concentrated in areas of cover within hedgerows, treelines and scrub.

The drainage ditch provides suitable habitat for breeding Common Frog Rana temporania and Smooth Newt *Lissotriton vulgaris.* Common Lizard *Zootoca vivipara* is considered widespread.

The drainage ditch is unlikely to support significant fish life and is unsuitable for migratory salmonid species (Atlantic Salmon *Salmo salar* or Trout *S. trutta*) or species of high conservation value (Eel *Anguilla anguilla*, Lamprey *Lampetra sp.* etc.).

Most habitats, even highly altered ones, are likely to harbour a wide diversity of invertebrates. In Ireland only one insect is protected by law, the Marsh Fritillary butterfly *Euphydryas aurinia*, and this is not to be found on in this area. Other protected invertebrates are confined to freshwater and wetland habitats and are not present on this site. Marsh Fritillary is not recorded from this vicinity and is unlikely to be present given its habitat preferences.

5.3.4 Overall Evaluation of the Context, Character, Significance and Sensitivity of the Proposed Development Site

In summary, it has been seen that the application site is agricultural crops with traditional field boundaries. These boundaries are of high local value to biodiversity. There are no examples of habitats listed on Annex I of the Habitats Directive or records of rare or protected plants. There are no species listed as alien invasive as per SI 477 of 2011.

Field boundaries on the subject site provide habitat for common breeding birds and foraging areas for bats.

Significance criteria are available from guidance published by the National Roads Authority (NRA, 2009). These are reproduced in table 7. From this an evaluation of the various habitats and ecological features on the site has been made and this is shown in table 8.

Figure 2 – Habitat map of the subject lands superimposed on an aerial photograph (photo from *www.google.com*)

Table 7 Site evaluation scheme taken from NRA guidance 2009

Site Rating	***Qualifying criteria***
A - International importance	SAC, SPA or site qualifying as such. Sites containing 'best examples' of Annex I priority habitats (Habitats Directive). Resident or regularly occurring populations of species listed under Annex II (Habitats Directive); Annex I (Birds Directive); the Bonn or Berne Conventions. RAMSAR site; UNESCO biosphere reserve; Designated Salmonid water
B - National importance	NHA. Statutory Nature Reserves. Refuge for Flora and Fauna. National Park. Resident or regularly occurring populations of species listed in the Wildlife Act or Red Data List 'Viable' examples of habitats listed in Annex I of the Habitats Directive

C - County importance	Area of Special Amenity, Tree Protection Orders, high amenity (designated under a County Development Plan) Resident or regularly occurring populations (important at a county level, defined as >1% of the county population) of European, Wildlife Act or Red Data Book species Sites containing semi-natural habitat types with high biodiversity in a county context, and a high degree of naturalness, or populations of species that are uncommon in the county
D - Local importance, higher value	Sites containing semi-natural habitat types with high biodiversity in a county context, and a high degree of naturalness, or populations of species that are uncommon in the locality Sites or features containing common or lower value habitats, including naturalised species that are nevertheless essential in maintaining links and ecological corridors between features of higher ecological value.
E - Local importance, lower value	Sites containing small areas of semi-natural habitat that are of some local importance for wildlife; Sites or features containing non-native species that are of some importance in maintaining habitat links.

Table 8 Evaluation of the importance of habitats and species on the Newtown site

Arable crops – BC1 Cypress treeline – WL2	Negligible ecological value
Scrub – WS1	Low local ecological value
Treeline – WL2 Hedgerow – WL1 (with drainage ditch – FW4)	High local ecological value

5.4 Characteristics of the Proposed Development

The proposed development will see site clearance and the removal of habitats within the red line boundary, followed by a construction phase to include new buildings and all associated infrastructure as. Post construction the land will be landscaped. Refer to the detailed description provided in chapter 3.

5.5 Potential Impact of the Proposed Development

This section provides a description of the potential impacts that the proposed development may have on biodiversity in the absence of mitigation. Methodology for determining the significance of an impact has been published by the NRA. This is based on the valuation of the ecological feature in question (table 8) and the scale of the predicted impact. In this way, it is possible to assign an impact significance in a transparent and objective way. Any impact that is 'moderate', 'major' or 'severe' will be considered to be significant. Table 9 summaries

the nature of the predicted impacts. The description of significance of effects contained in Table 11 of this Report is based on Table 3.3 of the EIAR Draft Guidelines (EPA, 2017)

5.5.1 Construction Phase

In the absence of mitigation the following potential impacts are likely to occur during the construction phase:

1. The removal of habitats including arable cropland, hedgerows and scrub. Habitats are mostly of low ecological value while the boundary hedgerows and treelines can be considered to be of high local value due to age and structure. Approximately 625m of internal hedgerow is to be lost (out of a total 1,040m) including the 160m of drainage ditch. These are locally high value habitats. In addition approximately 3,200m2 of scrub will be removed. This will result in the loss of habitat for common birds, insects and plants. External boundaries, comprising 625m of hedgerow and 100m of treeline are to be retained.

2. The direct mortality of species during demolition. This impact is most acute during the bird breeding season which can be assumed to last from March to August inclusive.

3. Pollution of water courses through the ingress of silt, oils and other toxic substances. The drainage ditch is to be infilled and this will result in the loss of sediment to the water course. It is not however a sensitive water course, in terms of spawning fish and so this impact is unlikely to be significant. There are no sensitive fish spawning habitats downstream as the River Boyne in this location is tidal in nature. Nevertheless, the estuary is of international value to biodiversity and so mitigation should be employed to minimise pollution to the greatest degree possible.

4. Damage to hedgerows and treelines to be retained. Hedgerows and treelines that are to be conserved are at risk from the movement of machinery and storage of materials that can compact soil. This in turn can damage the root structure of trees and other vegetation, leading to long-term impacts such as vulnerability to disease.

5.5.2 Operation Phase

In the absence of mitigation the following potential impacts are likely to occur during the operation phase:

5. Habitat fragmentation. The loss of hedgerow habitat may affect foraging bat populations. According to the bat report:

Reduced vegetation including the removal of mature trees may lead to reduced insect abundance. The removal of the drainage ditch, vegetation removal and change of land use and habitats will reduce bat feeding opportunities. This area was not highly active in terms of bat activity in May 2019. This is likely to be a permanent slightly negative impact.

6. Pollution of water from foul wastewater arising from the development. Wastewater will be sent to the municipal treatment plant at Drogheda, which is operated by Irish Water under licence from the EPA (licence no.: D0041-01). The Annual Environmental Report for 2017 (the most recent available) shows that it did not meet its requirements under the Urban Wastewater Treatment Directive. This was due to the failure of a single sample for ammonia. The exact cause of this exceedance is given as 'unknown'. This plant discharges into the Boyne Estuary however monitoring of the receiving environment indicates that the discharge "does not have an observable negative impact on the water quality". There is a treatment capacity of 101,600 population equivalent (P.E.) while the mean loading in 2016 was 52,612 P.E. This indicates that sufficient capacity exists to successfully treat the expected additional loading from this development. Correspondence from Irish Water has confirmed the feasibility of a connection for this development.

7. Pollution of water from surface water run-off. Where soil and natural vegetation, which is permeable to rainwater and slows its flow, is replaced with impermeable hard surfaces, changes to surface water quality and quantity can occur. This will ultimately connect to an existing surface water sewer, discharging to the River Boyne. Volumes entering the sewer are minimised in the first instance through the use of SUDS such as water butts, swales and filter drains. Excess run off will be divided into three catchment areas, each with their own underground attenuation storage, flow control device and petrol interceptor. In this way the quality and quantity of surface run-off will remain at the 'greenfield' rate. No negative effects to water quality in the River Boyne are expected to arise from this source. In this instance, the incorporation of SUDS attenuation measures will result in no negative effect to surface water quality.

8. Disturbance to species during operation. Disturbance to species from increased human activity (including vehicle traffic, noise, artificial light, pets etc.). This effect must be considered in the context of the existing environment, which is already close to high density residential areas and transport infrastructure, which are either existing or underway. This brings with it noise and light pollution which will both increase with this development. Artificial lighting is known to have impacts on animal activity through both attractive and repellent forces. The effects are species and location specific, for instance some Bats are attracted to lights as prey items become concentrated around light sources (Rich & Longcore, 2006 eds). However other species may be deterred. Impacts are also related to the type of lighting used and so the ultimate impact is dependent on the species of Bat that may be present within the zone of influence and the final design of lighting for the project. Brown Long-eared Bat, Whiskered

bat, Natterer's bat, Daubenton's bat and Lesser Horseshoe Bat are considered by Bat Conservation Ireland as being most susceptible to lighting effects – these species were not recorded as part of the bat survey. The details of lighting will only be provided post-planning. Mitigation has therefore been recommended to address this impact.

There has been little study meanwhile on the effects of noise on terrestrial animals however it is believed that many species can adapt to elevated ambient noise levels. The subject site is considered to be of a sufficient distance from the Boyne Estuary (over 300m) so that disturbance effects from noise will not occur to birds which use this area.

The introduction of household pets, particularly cats, has been a cause of concern given the degree to which they prey on wild mammals and birds. There is no known research on this issue from Ireland. However, the UK's Royal Society for the Protection of Birds states on its website that "despite the large numbers of birds killed [estimated at up to 55 million per annum in the UK], there is no scientific evidence that predation by cats in gardens is having any impact on bird populations UK-wide."

9. Landscaping. A detailed landscaping plan has been developed and includes areas of pollinator-friendly planting, following recommendations in the All-Ireland Pollinator Plan from the National Biodiversity Data Centre. The plan includes new, linear native woodland planting along either side of the main access road and which is estimated to be at least 700m in length. It is considered that these measures will ensure that connectivity is maintained and that no significant loss of habitat will arise from the development.

10. Impacts to Natura 2000 areas (SACs or SPAs) in and along the River Boyne could not be ruled out as part of the AA Screening carried out for this development application. This could arise from construction pollution to intertidal habitats. A Natura Impact Statement was subsequently prepared which recommended mitigation measures to ensure that pollution is avoided.

Table 9 summaries the nature of the predicted impacts prior to mitigation measures being incorporated.

Table 9 Nature of predicted impacts in the absence of mitigation

Impact		Direct/ Indirect	Cumulative	Duration[6]	Reversible?	Positive/ Negative
Construction Phase						
1	Habitat loss	Direct	Yes	Permanent	No	Negative
2	Species Mortality	Direct	No	Permanent	No	Negative
3	Pollution of water courses	Indirect	Yes	Temporary	Yes	Significant
4	Damage to hedgerows to be retained	Indirect	No	Permanent	No	Negative
Operation Phase						
5	Habitat fragmentation incl. loss of bat foraging habitat	Indirect	Yes	Permanent	Yes	Negative
6	Wastewater	Indirect	Yes	Permanent	Yes	Neutral
7	Surface water run-off	Indirect	Yes	Permanent	Yes	Neutral
8	Disturbance to species during operation	Indirect	Yes	Permanent	Yes	Negative
9	Landscaping	Direct	Yes	Permanent	Yes	Positive
10	Impacts to protected areas	Indirect	No	Temporary	Yes	Negative

Table 10 below assesses the scale and likelihood of the predicted impacts of the proposed development in the absence of mitigation.

[6] Temporary: up to 1 year; Short-term: 1-7 years; Medium-term: 7-15 years; Long-term: 15-60 years; Permanent: >60 years (NRA, 2006)

Table 10 Scale and likelihood of predicted impacts in the absence of mitigation.

Impact		Magnitude	As proportion of resource	Likelihood
Construction Phase				
1	Habitat loss	~625m of higher significance hedgerow with drainage ditch	60% of total	Certain
		~3,200m2 of scrub	100%	
		Remaining areas of arable crops	100%	
2	Mortality to animals during construction	Not possible to quantity.	N/A	Certain but magnitude depends on timing of works
3	Pollution of water	Not possible to quantity but the Boyne Estuary is a sensitive receptor	N/A	Possible
4	Damage to hedgerow to be retained	Approximately 515m of hedgerow and treeline are to be retained	Could affect 100%	Likely but depends upon site practices
Operation Phase				
5	Habitat fragmentation	Three species of bat are using the site	Will affect all foraging Bats if	Likely
6	Wastewater pollution	Not possible to quantify	N/A	No impacts are likely
7	Surface water pollution	Not possible to quantify	N/A	No impacts are likely
8	Disturbance to species from increased human activity (incl. noise/ lighting/ pets)	No data on bats which may be present. Lighting effects will be minimised at the lighting design stage.	Could impact upon the bat population although many species considered to be resilient	Possible
9	Creation of new landscaped areas	New planting will provide habitat for nesting birds and/or invertebrates	700m of new native linear woodland plus pollinator friendly planting	Certain.
10	Impacts to protected areas	No impacts predicted	N/A	Possible

Tables 9 to 10 are combined to determine the level of significance of any given impact. This is shown in table 11.

Table 11 Significance level of likely impacts in the absence of mitigation

Impact		Significance in the absence of Mitigation
Construction phase		
1	Habitat loss of features of negligible or local value (lower importance), arable cropland, scrub, Cypress treeline	Slight effect
	Habitat loss of features of high local value - hedgerow	Significant effect
2	Mortality to animals during construction including bats.	Significant effect
3	Pollution of water during construction phase	Significant effect
4	Damage to hedgerows to be retained	Significant effect
Operation Phase		
5	Habitat fragmentation incl. loss of bat foraging habitat	Moderate effect
6	Wastewater pollution	Imperceptible
7	Surface water pollution	Imperceptible
8	Disturbance to species from human disturbance	Moderate effect
9	Landscaping	Moderate positive over the long term through additional planting and habitat creation
10	Protected areas	Significant – likely significant effects to Natura 2000 not ruled out.

Overall it can be seen that a number of potentially significant impacts are predicted to occur as a result of this project in the absence of mitigation.

5.5.3 Do Nothing Impact

There are no immediate threats to the hedgerow habitats or species of interest assuming current agricultural management practices continue. A new access road and 133no. houses have been permitted and this is resulting in the loss of some habitat, particularly hedgerows.

Water quality may improve in the Boyne estuary with the implementation of the Water Framework Directive over the 2018-2021 period.

5.5.4 Cumulative impacts

A number of the identified impacts can also act cumulatively with other impacts from similar developments in this area of Drogheda. This will include the permitted road and 133no. houses to be constructed to the east of the development site and which will provide access to the R150 road to the north. These impacts primarily arise through the additional loading to the municipal Wastewater Treatment Plant. It is considered that this effect is not significant due to the existing capacity of the existing plant.

In this instance, the incorporation of SUDS attenuation measures will result in no negative effect to surface water quality.

Increasing urbanisation, and in particular land use change from agricultural to urban uses, is resulting in the loss of habitat for common species of plants and animals. This project will contribute to that loss arising from the removal of high local value hedgerows and treelines.

5.6 AVOIDANCE, REMEDIAL AND MITIGATION MEASURES

This report has identified five impacts that were assessed as' significant' or 'moderate' effect without mitigation and therefore mitigation is needed to reduce the severity of this potential effect.

5.6.1 Mitigation Measures Proposed

The following mitigation measures are proposed for the development

Construction Phase

1: Habitat loss – mitigation remedy/offsetting

Compensatory tree and supplementary hedgerow planting has been included to offset the loss of hedgerows arising from this project. Along with areas of pollinator-friendly planting, it is considered that in time, this will reduce the overall impact of this effect to be Slight.

2: Mortality to animals during construction -mitigation by avoidance

Deliberate disturbance of a bird's nest is prohibited unless under licence from the National Parks and Wildlife Service. If possible, site clearance works should proceed outside the nesting season, i.e. from September to February inclusive. If this is not possible, vegetation must first be inspected by a suitably qualified ecologist. If a nest is encountered then works must stop, until such time as nesting has ceased. Otherwise, a derogation licence must be sought from the NPWS to allow the destruction of the nest.

Suitable roost sites are available for bats in mature trees (although these trees are not to be directly affected).

Preliminary mitigating measures are contained in the Bat Assessment that accompanies this EIAR under separate cover. This includes the following:

All trees with roost potential shall be felled between September and November to ensure that bats are not breeding or hibernating within trees and to ensure that nesting birds are unaffected (March 1st to August 31st).

3. Damage to hedgerows to be retained – mitigation by avoidance

To avoid this the developer should follow the guidance from the National Roads Authority in establishing root protection areas (RPA) along hedgerows to be retained. The NRA gives the following equation for calculating the root protection area (RPA) (NRA, unknown year):

RPA(m2) = π(stem diameter mm 12)/1,000) x2

The RPA gives the area around which there should be no disturbance or compaction of soil. This will be calculated for the largest tree within each hedgerow. Prior to construction this area will be clearly labelled 'sensitive ecological zone', fenced off with durable materials and instruction given to construction personnel not to disturb this buffer zone. As a rule of thumb this buffer zone should extend at least to the canopy of the trees concerned.

4. Pollution during construction

Construction will follow guidance from Inland Fisheries Ireland (IFI, 2016) for the protection of fish habitat. Surface run off from the site will only be discharged to local drains via a settlement pond so that only silt-free water will enter the environment.

Dangerous substances, such as oils, fuels etc., will be stored in a bunded zone. Emergency contact numbers for the Local Authority Environment Section, Inland Fisheries Ireland, the Environmental Protection Agency and the National Parks and Wildlife Service will be displayed in a prominent position within the site compound. These agencies will be notified immediately in the event of a pollution incident.

Site personnel will be trained in the importance of preventing pollution and the mitigation measures described here to ensure same.

The site manager will be responsible for the implementation of these measures. They will be inspected on at least a daily basis for the duration of works, and a record of these inspections will be maintained. See section 10 of the Preliminary CMP.

Operational

5. Habitat fragmentation incl. loss of bat foraging habitat -

It is considered that new habitat creation along the access road will ensure that long-term, negative impacts arising from fragmentation will not occur.

6. Disturbance to species from human disturbance

As part of the submission of details to the Planning Authority, the lighting plan should be reviewed by the bat ecologist. This should ensure that lighting is not directed at semi-natural vegetation and that every effort is made to minimise lighting to the greatest degree feasible.

7. Impacts to protected areas

The AA Screening which was carried out concluded that significant effects to the Boyne Estuary SAC could not be ruled out. On foot of this conclusion, a Natura Impact Statement was prepared which identified mitigation measures to be carried out and which will ensure that the integrity of the SAC will not be affected. These measures are designed to avoid pollution during the construction phase and are described under point 4 above.

5.7 PREDICTED IMPACTS OF THE PROPOSED DEVELOPMENT

This section allows for a qualitative description of the resultant specific direct, indirect, secondary, cumulative, short, medium and long-term permanent, temporary, positive and negative effects as well as impact interactions which the proposed development may have, assuming all mitigation measures are fully and successfully applied.

According to the Bat Assessment "*it is anticipated that this development will have no direct impact upon the conservation status of any bat species*"

Table 12 Significance level of likely impacts with mitigation

Impact		Significance in the absence of Mitigation
Construction phase		
1	Habitat loss of features of negligible or local value (lower importance), arable cropland, scrub, Cypress treeline	Slight effect
	Habitat loss of features of high local value - hedgerow	Moderate effect
2	Mortality to animals during construction including bats.	Slight effect
3	Pollution of water during construction phase	Imperceptible
4	Damage to hedgerows to be retained	Imperceptible

Operation Phase		
5	Habitat fragmentation incl. loss of bat foraging habitat	Slight effect
6	Wastewater pollution	Imperceptible
7	Surface water pollution	Imperceptible
8	Disturbance to species from human disturbance	Moderate effect
9	Landscaping	Moderate positive over the long term through additional planting and habitat creation
10	Protected areas	Not significant

With the recommended mitigation, significant negative effects are not anticipated to other wildlife or habitats.

5.8 MONITORING

Monitoring is required where the success of mitigation measures is uncertain or where residual impacts may in themselves be significant. In this case no significant negative effects or residual impacts are likely to arise, and so additional monitoring is not required.

5.9 DIFFICULTIES ENCOUNTERED

No difficulties were encountered for this study.

5.10 REFERENCES

Bullock C., Kretch C. & Candon E. 2008. *The Economic and Social Aspects of Biodiversity*. Stationary Office.

Clabby, K.J., Bradley, C., Craig, M., Daly, D., Lucey, J., McGarrigle, M., O'Boyle, S., Tierney, D. and Bowman, J. 2008. *Water Quality in Ireland 2004 – 2006.* EPA.

Colhoun K. & Cummins S. 2013. *Birds of Conservation Concern in Ireland 2014 – 2019.* Irish Birds. Volume 9 Number 4 pg523-541.

Cooney R. & Dickson B. 2005. *Biodiversity and the Precautionary Principle.* Earthscan.

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

Council Directive 97/11/EEC of 3rd March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment

Council 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 – more commonly known as the Water Framework Directive

Department of Arts, Heritage and the Gaeltacht. 2011. *Actions for Biodiversity 2011 – 2016. Ireland's National Biodiversity Plan.*

DG Environment. 2010. *Natura 2000 European Commission Nature and Biodiversity Newsletter.* Number 28. June 2010. ISSN: 1026-6151.

EPA. 2002. *Guidelines on the information to be contained in Environmental Impact Statements.*

EPA, 2003. *Advice Notes on Current Practice (in the preparation of Environmental Impact Statements)*

Fitter R., Fitter A. & Farrer A. 1984. *Grasses, sedges, rushes and ferns of Britain and Northern Europe.* Collins.

Fossitt J. 2000. *A Guide to Habitats in Ireland*. Heritage Council.

Harris S. & Yalden D.W. 2008. *Mammals of the British Isles: Handbook, 4th Edition.* The Mammal Society.

Hill M.O., Blackstock T.H., Long D.G. and Rothero G.P 2008. *A Checklist and Census Catalogue of British and Irish Bryophytes.* British Bryological Society.

Hundt L. 2012. *Bat Surveys: Good Practice Guidelines. 2nd Edition.* Bat Conservation Trust.

IEEM. 2016. *Guidelines for Ecological Impact Assessment in the United Kingdom.* Institute of Ecology and Environmental Management.

Institute of Environmental Assessment, 1995. *Guidelines for Baseline Ecological Assessment*'

Johnson O. & More D., 2004. *Tree Guide*', Collins

King, J.L., Marnell, F., Kingston, N., Rosell, R., Boylan, P., Caffrey, J.M., FitzPatrick, Ú., Gargan, P.G., Kelly, F.L., O'Grady, M.F., Poole, R., Roche, W.K. & Cassidy, D. 2011. Ireland Red List No. 5: Amphibians, Reptiles & Freshwater Fish. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht, Dublin, Ireland.

Lewis L., Burke B. & Crowe O. 2016. *Irish Wetland Bird Survey: Results of Waterbird Monitoring in Ireland in 2014/15.*

Mason C.F. 1996. *Biology of Freshwater Pollution.* Longman.

Morris P. & Therivel R., 2001. *Methods of Environmental Impact Assessment,* Spon Press

NRA. 2009. *Guidelines for Assessment of Ecological Impacts of National Road Schemes.* National Roads Authority.

Parnell J. & Curtis T. 2012. *Webb's An Irish Flora.* Cork University Press.

Preston C.D., Pearman D.A. & Dines T.D. 2002. *New Atlas of the British & Irish Flora*. Oxford University Press.

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*. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Ireland.

Rich C. & Longcore T. Editors. 2006. *Ecological Consequences of Artificial Night Lighting.* Island Press.

Sargent G. & Morris P. 2003. *How to Find & Identify Mammals.* The Mammal Society.

Smith G. F., O'Donoghue P., O'Hora K. and Delaney E. 2010. *Best Practice Guidance for Habitat Survey and Mapping.* Heritage Council.

Stace C. 2010. *New Flora of the British Isles.* Cambridge University Press

Statutory Instrument No. 94 of 1999. Flora (Protection) Order

Treweek J., 1999. *Ecological Impact Assessment*', Blackwell Science.

United Nations. 1992. *Convention on Biological Diversity*