to the identification of connectivity between proposed scheme and Special Protection Areas. The guidance takes into consideration the distances species may travel beyond the boundary of their SPAs and provides information on dispersal and foraging ranges of bird species which are frequently encountered when considering plans and projects.

- Table 5.2, provides details of all relevant Designated Sites as identified in the preceding steps and assesses which are within the likely Zone of Impact.
- The site synopses and conservation objectives of these sites, as per the NPWS website (www.npws.ie), were consulted and reviewed at the time of preparing this report 12/05/2020.
- Where potential pathways for Significant Effect are identified, the site is included within the Likely Zone of Impact and further assessment is required.

Nationally Designated Sites

Using GIS software, sites designated for nature conservation within the potential ZOI of the proposed scheme were identified. The ZOI was derived utilising a precautionary approach. Initially, sites within a 15 kilometre radius of the proposed works were identified. Designated sites located outside the 15km buffer zone were also considered. However, in this case, no potential for impacts outside the 15km buffer was identified. The 15km buffer distance was extrapolated from DoEHLG Guidance on Appropriate Assessment (2010).

The designated sites are listed below in Table 5. 2 and displayed on Figure 5.2.

Designated site and code	Distance from proposed works (Km)	Pathway for Effect
Natural Heritage Area (NHA)		
Forrew Bog NHA (002432)	7.4km north-west	In relation to potential impacts, no complete source-pathway-receptor chain could be identified between the proposed works and the NHA. The NHA is located in a separate surface water catchment to the proposed works (EPA web-mapper 2020). No potential for significant effects was identified.
Croaghmoyle Mountain NHA (002383)	14.4km south	In relation to potential impacts, no complete source-pathway-receptor chain could be identified between the proposed works and the NHA. The NHA is located in a separate surface water catchment to the proposed works (EPA web-mapper 2020). No potential for significant effects was identified.
Cunnagher More Bog NHA (002420)	14.8km south-east	In relation to potential impacts, no complete source-pathway-receptor chain could be identified between the proposed works and the NHA. The NHA is located in a separate surface water catchment to the

		proposed works (EPA web-mapper 2020). No potential for significant effects was identified.
Proposed Natural Heritage Area (pNHA)		
Lough Conn And Lough Cullin (000519)	0.3km east	Due to the close proximity of this pNHA with the site of proposed works and that surface water connectivity exists, a pathway for potential effects on this site was identified and will be considered further in this report.
Bellacorick Bog Complex (001922)	5.3km east	Given the distance between the pNHA and the proposed works along with the fact that the designated site is located upstream in the catchment, no complete impact source-pathway-receptor chain could be identified. No potential for significant effects was identified.
Lough Alick (001527)	7.0km south-east	Given the distance between the pNHA and the proposed works, no viable complete impact source-pathway-receptor chain could be identified. The pNHA is located in a separate surface water catchment to the proposed works (EPA web-mapper 2020). No potential for significant effects was identified.
Cloonagh Lough (Mayo) pNHA (001485)	7.4km	Given the distance between the pNHA and the proposed works and the lack of any identifiable habitat or hydrological connectivity, no viable complete impact source-pathway-receptor chain could be identified. No potential for significant effects was identified.
Drumleen Lough pNHA (001499)	10.4km	Given the distance between the pNHA and the proposed works along with the fact that the designated site is located upstream in the catchment, no complete impact source-pathway-receptor chain could be identified. No potential for significant effects was identified.
Killala Bay/Moy Estuary pNHA (000458)	10.7km (>45km via surface waters)	Given the nature and scale of the proposed works, their distance from the pNHA and the buffering effect of the Lough Conn and Lough Cullin, no potential for significant effects is identified. The designated site is located greater than 45km downstream (surface water distance) from the proposed works area and is designated for the protection of coastal habitats. Potential to significant

		impacts to occur as a result of the proposed scheme was not identified.
Killala Esker pNHA (001517)	13.1km	Given the distance between this terrestrial pNHA and the proposed works and the lack of any habitat connectivity, no complete impact source-pathway-receptor chain was identified. No potential for significant effects was identified.
Moy Valley pNHA (002078)	14.2km (>20km via surface waters)	Given the nature and scale of the proposed works, their distance from the pNHA and the buffering effect of the Lough Conn and Lough Cullin, no potential for significant effects is identified. The designated site is located greater than 20km downstream (surface water distance) from the proposed works area and is designated for the protection of coastal habitats. Potential to significant impacts to occur as a result of the proposed scheme was not identified.
Bellacorick Iron Flush pNHA (000466)	14.5km	The pNHA is located in a separate surface water catchment to the proposed works (EPA web-mapper 2020). Given the distance and lack of surface water connectivity between the pNHA and the proposed works, no complete impact source-pathway-receptor chain could be identified No potential for significant effects was identified.

Table 5.2: Nationally Designated sites within the Zone of Influence

Where a nationally designated site overlaps with the boundary of a European designated site the potential for impacts has been considered with reference to the European designation as part of the assessment undertaken in the Natura Impact Statement to facilitate the competent authority undertaking an appropriate assessment in respect of them, that is summarized in the following section.

None of the NHAs or pNHAs within the ZOI that are not also designated as European Sites were considered as KERs in their own right for the following reasons:

- Where a nationally designated site overlaps with the boundary of a European designated site the potential for impacts has been considered with reference to the European designation
- Distance/intervening buffer from the proposed scheme
- Nature of the conservation sites (e.g. terrestrial nature of habitats)
- There are no sites with hydrological connectivity which could potentially be affected.

European Sites

An Appropriated Assessment Screening and Natura Impact Statement have been prepared to provide the competent authority with the information necessary to complete an Appropriate Assessment for the proposed scheme in compliance with Article 6(3) of the Habitats Directive. Figure 5.1 shows the European Sites in proximity to the proposed flood relief scheme.

As per EPA draft Guidance 2017, "a biodiversity section of an EIAR, should not repeat the detailed assessment of potential effects on European sites contained in a Natura Impact Statement" but should "incorporate their key findings as available and appropriate". This section provides a summary of the key assessment findings set out in the Natura Impact Statement with regard to the relevant Special Areas of Conservation and Special Protection Areas.

The potential for the proposed flood relief scheme to result in adverse effects on the River Moy SAC and Lough Conn And Lough Cullin SPA, without mitigation, could not be excluded in the assessment contained in the Appropriate Assessment Screening report and a Natura Impact Statement was prepared. The potential for the proposed scheme to result in adverse effects on the integrity of these sites was considered in light of the conservation objectives of the sites and in combination with other plans and projects and the following conclusion was reached (based on the reasons set out in the NIS) :

It can be excluded, on the basis of objective scientific information, that the project, on its own or in combination with other plans or projects, will not adversely affect the integrity of any European Site having regard to their site conservation objectives.

5.3.2. Flora and Fauna

5.3.2.1. New Flora Atlas

A search was made in the New Atlas of the British & Irish Flora (Preston *et al*, 2002) (this is the most recent source) to investigate whether any rare or unusual plant species listed under Annex I of the EU Habitats Directive, The Irish Red Data Book, 1, Vascular Plants (Curtis, 1988) or the Flora (Protection) Order (1999, as amended 2015) had been recorded in the relevant 10km squares in which the study site is situated (G11 and G12). Each hectad contains 100 whole one kilometre squares containing terrestrial habitats. Species of conservation adconcern are given in Table 5.3.

Red List – Irish Red Lists (Jackson *et al.* 2016)

Common Name	Scientific Name	Conservation Status	Hectad
Great Burnet	*Sanguisorba officinalis*	Red List – *Vulnerable*	G11
Fragrant Agrimony	*Agrimonia procera*	Red List – *Near Threatened*	G11
Corn Marigold	*Chrysanthemum segetum*	Red List – *Near Threatened*	G11
Common Gromwell	*Lithospermum officinale*	Red List – *Near Threatened*	G11
Brown Beak-sedge	*Rhynchospora fusca*	Red List – *Near Threatened*	G11
Least bur-reed	*Sparganium natans*	Red List – *Near Threatened*	G11, G12

Table 5.3 Plant species of conservation concern recorded within hectads G11 and G12

5.3.2.2. Bryophytes

A search of the NPWS online data map for bryophytes (NPWS 2018a) was also undertaken with no protected bryophytes recorded within or adjacent to the proposed scheme site.

5.3.2.3. NPWS Records of Protected Species

NPWS online records were searched to see if any rare or protected species of flora or fauna have been recorded from hectads G11 and G12. An information request was also sent to the NPWS requesting records from the Rare and Protected Species Database. Tables 5.4 lists rare and protected species records obtained from NPWS.

EU HD – EU Habitats Directive (Council Directive 92/43/EEC), WA 1976-2017 – Wildlife Act 1976 & (Amendment) Act, 2017, FPO – Flora (Protection) Order 2015, Red List – Irish Red Lists (Jackson et al. 2016, King et al. 2011, Kingston & Looney 2009)

Common Name	Scientific Name	Conservation Status	Hectad
White-clawed Crayfish	*Austropotamobius pallipes*	EU HD Annex II, Annex V, WA 1976 – 2017	G11, G12
Common frog	*Rana temporaria*	EU HD Annex V, WA 1976 - 2017	G11, G12
Sea lamprey	*Petromyzon marinus*	EU HD Annex II, Red List – Near Threatened, OSPAR	G11

Fallow Deer	*Dama dama*	HI Invasive Species, Invasive Species Reg S.I. 477, WA 1976 - 2017	G11
West European Hedgehog	*Erinaceus europaeus*	WA 1976 – 2017	G11
Irish Hare	*Lepus timidus subsp. hibernicus*	EU HD Annex V, WA 1976 - 2017	G11, G12
European Otter	*Lutra lutra*	EU HD Annex II, Annex IV, WA 1976 – 2017	G11, G12
Pine Marten	*Martes martes*	EU HD Annex V, WA 1976 - 2017	G11
Eurasian Badger	*Meles meles*	WA 1976 – 2017	G11, G12
Irish Stoat	*Mustela erminea subsp. hibernica*	WA 1976 – 2017	G11
Freshwater Pearl Mussel	*Margaritifera margaritifera*	EU HD Annex II, Annex V, WA 1976 – 2017	G11, G12
Salmon	*Salmo salar*	EU HD Annex II, Annex V, WA 1976 – 2017	G12
Great Burnet	*Sanguisorba officinalis*	Red List: *Vulnerable*	G11
Irish Lady`s – tresses	*Spiranthes romanzoffiana*	FPO, Red List-Vulnerable	G11
Barn Owl	*Tyto alba*	WA 1976 – 2017, RL	G11

Table 5.4 NPWS records for protected species records for hectads G11 and G12

5.3.2.4. NPWS Article 17 Datasets and Additional Habitat Databases

A review of the NPWS Habitat Directive - Article 17 datasets, Irish Semi-Natural Grassland Survey datasets, National Survey of Native Woodland datasets along with Long Established Woodland dataset was conducted on the 3rd of October 2016, prior to undertaking the multi-disciplinary walkover survey, and reviewed again on the 12th of May 2020. The datasets were downloaded and overlain on the proposed scheme area.

No records for Annex I habitats or long-established woodland habitats were recorded within the proposed scheme area. A block of Annex I Alluvial Woodland 91E0 is located approximately 1km to the south of the study area. This area was surveyed as part of the National Survey of Native Woodlands and is referenced as site 1800 (Perrin 2008). The site was surveyed in 2007. This site is also recorded in the long-established woodland database.

5.3.2.5. National Biodiversity Data Centre Data

A search of the National Biodiversity Data Centre (NBDC) website was conducted with a focus on records of protected fauna, excluding birds, recorded from hectads G11 and G12. The results of the database search are provided below in Table 5.5. Table 5.6 includes records of non-native invasive species listed under the Third Schedule of the European Communities Regulations 2011 (S.I. 477 of 2015).

EU HD – EU Habitats Directive (Council Directive 92/43/EEC), WA– Wildlife Act 1976 & (Amendment) Act 2000, Red List – Irish Red Lists (Regan *et al.* 2010, Byrne *et al.* 2009, Kingston & Looney 2009)

Common Name	Scientific Name	Conservation Status	Hectad
Common Frog	*Rana temporaria*	EU HD Annex V, WA	G11, G12
Atlantic Salmon	*Salmo salar*	EU HD Anenx II	G11
Freshwater White-clawed Crayfish	*Austropotamobius pallipes*	EU HD Annex II, WA	G11, G12
Red Deer	*Cervus elaphus*	WA	G12
West European Hedgehog	*Erinaceus europaeus*	WA	G11
Otter	*Lutra lutra*	EU HD Annex II & IV, WA, Red List – Near Threatened	G11, G12
Pine Marten	*Martes martes*	EU HD Annex V, WA	G11, G12
Badger	*Meles meles*	WA	G11, G12
Red Squirrel	*Sciurus vulgaris*	WA	G11

Daubenton's Bat	*Myotis daubentonii*	EU HD Annex IV, WA	G11, G12
Leisler`s Bat	*Nyctalus leisleri*	EU HD Annex IV	G12
Soprano Pipistrelle	*Pipistrellus pygmaeus*	EU HD Annex IV, WA	G11, G12

Table 5.5 NBDC records for protected species records for hectads G11 and G12

Common Name	Scientific Name	Conservation Status	Hectad
Japanese Knotweed	*Fallopia japonica*	HI Invasive Species, Invasive Species Reg S.I. 477	G11
Cherry Laurel	*Prunus laurocerasus*	HI Invasive Species	G11
Giant knotweed	*Fallopia sachalinensis*	HI Invasive Species, Invasive Species Reg S.I. 477	G12
Canadian waterweed	*Elodea canadensis*	HI Invasive Species, Invasive Species Reg S.I. 477	G12
Rhododendron	*Rhododendron ponticum*	HI Invasive Species, Invasive Species Reg S.I. 477	G11
American Mink	*Mustela vison*	HI Invasive Species, Invasive Species Reg S.I. 477	G11, G12
Brown Rat	*Rattus norvegicus*	HI Invasive Species, Invasive Species Reg S.I. 477	G11
House Mouse	*Mus musculus*	HI Invasive Species	G11
Fallow Deer	*Dama dama*	HI Invasive Species, Invasive Species Reg S.I. 477	G11, G12

Table 5.6 Third Schedule non-native invasive species records for hectad G11 and G12

5.3.2.6. Bat Conservation Ireland Database

A search for records of bat activity and roosts within a 10km radius of the study area was conducted using the Bat Conservation Ireland database. A number of records have been recorded within 10km of the

proposed works: roosts (1), transects (7), ad-hoc observations (9). The results of the database search are provided below in Table 5.7.

EU HD – EU Habitats Directive (Council Directive 92/43/EEC)

Survey Type	Location	Species Recorded	Survey	Bat Species Designation
Roost	House, Dun Ard, Gurleem, Ballina, G1922	Unidentified bat	Bats in Houses Project	N/A
Transect	Deelcastle Townland Transect, G178189	Myotis daubentonii	All Ireland Daubentons Bat Waterways Survey	EU HD Annex IV
	Layby at beginning at Knockmore village, G2303708066	Nyctalus leisleri, Pipistrellus pipistrellus, Pipistrellus spp.	BC Ireland Car Based Bat Monitoring Scheme	EU HD Annex IV
	Small layby before Knockmore, G2297407907	Nyctalus leisleri, Pipistrellus pipistrellus, Pipistrellus pygmaeus, Pipistrellus spp.	BC Ireland Car Based Bat Monitoring Scheme	EU HD Annex IV
	Outside bunglaow with private hedge and stone entrance. G204108	Pipistrellus pygmaeus, Pipistrellus spp.	BC Ireland Car Based Bat Monitoring Scheme	EU HD Annex IV
	End of row of houses with Leylandii hedge, G2037610851	Nyctalus leisleri, Pipistrellus pipistrellus, Pipistrellus pygmaeus, Pipistrellus spp., Unidentified bat	BC Ireland Car Based Bat Monitoring Scheme	EU HD Annex IV
	Stone cottage and barns on left, G2054616249	Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus spp., Unidentified bat	BC Ireland Car Based Bat Monitoring Scheme	EU HD Annex IV
	Stone cottage and barns on left, G2055616258	Nyctalus leisleri, Pipistrellus pygmaeus, Pipistrellus spp., Unidentified bat	BC Ireland Car Based Bat Monitoring Scheme	EU HD Annex IV
Other Observation	G143261	Myotis daubentonii, Pipistrellus pygmaeus	BATLAS 2010	EU HD Annex IV
	G138175	Nyctalus leisleri, Pipistrellus pipistrellus, Pipistrellus	BATLAS 2010	EU HD Annex IV

		pygmaeus		
	G063175	Pipistrellus pygmaeus, Pipistrellus spp.	BATLAS 2010	EU HD Annex IV
	G0642106845	Nyctalus leisleri, Pipistrellus pipistrellus, Pipistrellus pygmaeus	BATLAS 2010	EU HD Annex IV
	G102150	Pipistrellus pygmaeus, Unidentified bat	BATLAS 2010	EU HD Annex IV
	Ballintober bridge Mayo, G115124	Myotis daubentonii, Nyctalus leisleri, Pipistrellus pygmaeus	BATLAS 2010	EU HD Annex IV
	Mayo, G217233	Pipistrellus pygmaeus	BATLAS 2010	EU HD Annex IV
	Lahardaun village Mayo, G13440976	Myotis natterreri, Nyctalus leisleri, Pipistrellus pygmaeus	BATLAS 2010	EU HD Annex IV
	BL Built land CD Sand dune systems CM Salt marshes, G2312	N/A	EIS Surveys	EU HD Annex IV

Table 5.7 BCI data 10km radius of flood relief site at Crossmolina

5.3.2.7. Online Atlas of Freshwater Fish in Irish Lakes

The online Atlas of Freshwater Fish in Irish Lakes, which is a collaborative project between the National Biodiversity Data Centre and Inland Fisheries Ireland (IFI), was consulted. The following species were recorded in Lough Conn between 1990 and 1994 according to the atlas: Arctic Char (*Salvelinus alpinus*), Brown Trout (*Salmo trutta*), Perch (*Perca fluviatilis*), Pike (*Esox lucius*), Rudd (*Scardinius erythropthalmus*) and Salmon (*Salmo salar*).

5.3.2.8. Water Framework Directive Surveillance Monitoring Fish Stock Survey

A total of six species were recorded during the most recent Water Framework Directive surveillance monitoring fish stock survey carried out in the River Deel at Crossmolina on the 30th July 2012 by staff from Inland Fisheries Ireland IFI). These included: Roach (*Rutilus rutilus*), Perch (*Perca fluviatilis*), Eel (*Anguilla anguilla*), Salmon (*Salmo salar*), Pike (*Esox lucius*) and Lamprey (*Lampetra sp.*). The most abundant fish recorded was Perch (approximately 59% of the total catch). During the previous survey undertaken in 2008 close to Deel Castle, Brown Trout (*Salmo trutta*) was also found but Lamprey was not recorded. Roach was the most common species caught on this occasion.

5.3.2.9. Inland Fisheries Information

Inland Fisheries Ireland's website, http://www.fishinginireland.info, provides information on angling throughout the country. The best known and most frequently fished locations for Salmon on Lough Conn are

the northern end of the Lough particularly the area around the mouth of the Deel River, which is within the Study Area; and Victoria Bay, Cuilkillew (Cornakillew), Massbrook and Castlehill Bay in the south-western and western areas of the lake. The strait at Pontoon Bridge between Loughs Conn and Cullin was a favourite haunt for salmon anglers fishing from the shore. However in the interests of conservation this and other parts of the lake are currently closed to salmon fishing. Trout fishing on Lough Conn is described on the website as potentially 'very good but sporadic at times'.

5.3.2.10. Juvenile Lamprey Populations in the Moy Catchment

The NPWS commissioned a survey of juvenile lamprey populations in the Moy catchment, which was undertaken during July/August 2004. Five survey sites were located on the River Deel and one site was located at Pontoon - the connection between Lough Conn and Lough Cullin.

Lamprey species were found at three of the five sites sampled on the River Deel: at Deelcastle (*Lampetrra sp.* only), N59 Bridge (*Petromyzon marinus* and *Lampetra sp.*) and the Ford east of Ballycarroon House (*Petromyzon marinus* and *Lampetra sp.*). No lamprey were found at the other two sites at Ballmulty Bridge or Cominch Bridge. It is considered that an impassable natural barrier prevents access by lamprey to the upper reaches of the Deel. High densities of Sea Lamprey were found in undrained sections of the river in the vicinity of Ballycarroon House. Relatively high densities of *Lampetra* species were found at two sites, one upstream and one downstream of Crossmolina. A strong presence of Young-of-the Year (YOY) Sea Lamprey larvae was recorded in the River Deel. Extensive lamprey habitat was noted in the Deel River during the survey both in the undrained reaches of the river upstream of Crossmolina and in some drained stretches downstream of Crossmolina. However, it was considered in the report that construction of deflectors to improve salmon angling in the river may have reduced the extent of lamprey nursery habitat in lower reaches of the river.

By catch caught at the sampling sites on the River Deel included other fish species including: Atlantic Salmon, Brown Trout, European Eel, Three-spined Stickleback, Perch, Roach and Minnow. Records of the Annex II species Freshwater Pearl Mussel and White-clawed Crayfish were also noted during the survey. The Freshwater Pearl Mussel records were from previously unrecorded sites for this species (Ballymulty Bridge and the Ford east of Ballycarroon House). Since 2004, this population of Freshwater Pearl Mussel in the River Deel has been surveyed extensively and further information is provided below.

5.3.2.11. Freshwater Pearl Mussel

Freshwater Pearl Mussel (Margaritifera margaritifera) is listed on Annex II of the E.U. Habitats Directive and was first recorded from the Deel in 2004 and subsequently stretches of the river were surveyed in 2005 and 2008. The NPWS commissioned Evelyn Moorkens and Ian Killeen to conduct a survey with the objective of mapping the full distribution and to investigating the population profile of this species in the River Deel in 2009. The full report is provided as Appendix 5D.

Pearl Mussels were found in the River Deel over a distance of approximately 20 kilometres, with the downstream limit near Deelcastle (G175191). The upstream limit detected during the 2009 survey was just downstream of the confluence with the Shanvolahan River (G067154). Anecdotal evidence documented in the 2009 report indicates that there were specimens known in the area around and downstream of Deel Bridge within 10 years of the publication of the report. However despite potentially

suitable habitat no live or dead shells were found in this area by the surveyors in 2009. No mussels were found in tributaries of the River Deel.

Abundance of mussels varied widely over the 20 kilometre section, in which they occurred, although they were found to be present almost continuously throughout this stretch of the river. Geomorphological variation was considered to constitute the main factor in this variation, with land drainage schemes (in particular downstream of Crossmolina) and fisheries activities also important factors. The report identifies the area between Crossmolina and Ballynulty Bridge as being location of the core of the mussel population within the River Deel. Several sections within this stretch of the river were found to have abundant mussels (>1500 mussels per 100 metres length of river). Upstream of Ballynulty Bridge, mussel distribution was patchy and only small areas held moderately high numbers. Towards the upstream limit, numbers were restricted to occasional individuals. Downstream of Crossmolina, abundance was categorised predominantly as frequent with occasional sections classified as common.

A total population of approximately 89,000 individuals was estimated based on the numbers of mussels estimated for each survey section. As this number was considered to be an under-estimate, the likely population of this species in the River Deel was probably over 100,000 individuals at the time of the survey.

The report documents a relatively wide size profile with some evidence of recent juvenile recruitment. Juvenile mussels under 65mm in length corresponded to 7.8% of the total population. The ideal profile should have 20% of mussels under 65mm. Some parts of the river have a more favourable size profile such as downstream of Ballynulty Bridge, where 16.7% of the mussels were less than 65mm in length.

Redox potential measurements demonstrated that the substrate in the Deel is relatively highly silted in certain locations. Even in areas with the highest numbers and most favourable size profiles, the loss in redox at 5cm depth was over 25%. A level of 20% is considered necessary for effective juvenile recruitment.

The report describes the results of the survey as having found 'a large and important population of *Margaritifera*' still present in the River Deel 'with some recruitment of young mussels occurring, a rare situation in mussel populations in Ireland.' The very rare duck mussel *Anodonta anatina* was also found in the river during the survey. There are five status categories defined for populations of Freshwater Pearl Mussels in SACs and the River Deel population is considered to fit into Status 2, which is describes 'large widespread populations of adults, or smaller numbers in good but restricted habitat, some juveniles in more than one area.' 18.5% of populations in SACs in Ireland fall into this category. Based on these status categories the report concludes that the Deel population would rank as 7th out of 28 populations.

The report states that the Deel system is large and intensively managed in general and that recovery of the population to favourable status would be 'very challenging with strong management measures needed'. The majority of the mussels, and those with the most favourable size-age profile are found in areas of very fast flow within boulder dominated habitats, in conditions which mitigate against the effects of siltation and scouring respectively. The report further claims that the 'river would benefit from conservation management measures, both in its upper catchment to cease the input of fine sediment loading into the river from the peaty areas, and in the more intensively managed areas, where some buffering from intensive management is needed and drainage inputs need to be either blocked or

trapped en route.' The authors state that such a plan is important as many mussels in small number distributed throughout the river face extinction as they cannot currently recruit and groups of mussels in the fastest riffles are not likely to be sustainable without wider occupation. A sub-basin catchment management plan was recommended for the population of Freshwater Pearl Mussel in the River Deel.

5.3.3. EPA Water Quality Data

The River Deel is fed by the Slieveclaur stream and the Shanvolahan stream. The EPA Envision map viewer was consulted on 12th May 2020 regarding the water quality status of rivers and streams within the study area. The Biotic Index of Water Quality (BIWQ) was developed in Ireland by the Environmental Protection Agency (EPA). Q-values are assigned using a combination of habitat characteristics and structure of the macro-invertebrate community within the waterbody. Individual macro-invertebrate families are classified according to their sensitivity to organic pollution and the Q-value is assessed based primarily on their relative abundance within a sample. A number of sampling stations occur along the River Deel which is connected to the proposed works site. Q-values for a number of these sampling stations and their location in regard to the site of proposed works are shown in Table 5.8 below:

Sampling Station	Location (in regard to proposed works site)	Q-Value Rating
Ford u/s Deel R (Main Flow)	Upstream	4 (Good)
Deel Bridge	Upstream	4 (Good)
Ford S.W. of Knockbrack	Upstream	4 (Good)
Ford at Ballymulty	Upstream	5 (High)
Ford E. of Ballycarroon	Upstream	4 -5 (High)
Crossmolina Bridge	Downstream	4 (Good)
S.E of Crossmolina	Downstream	4 (Good)
800m d/s Crossmolina Bridge	Downstream	4 -5 (High)
N.W. rectory near old Abbey	Downstream	**4 (Good)**
Knockadangan Bridge	Downstream	4 -5 (High)
Bridge at Castle Gore	Downstream	4 -5 (High)

Table 5.8 Water Quality Sampling Stations along the River Deel

River Basin Management Plans (RBMPs) have been published for all River Basin Districts in Ireland in accordance with the requirements of the Water Framework Directive and have been superseded by the National River Basin Management Plan 2018 - 2021. The online EPA Envision map viewer provides access to water quality information at individual waterbody level and at Water Management Unit level for all the River Basin Districts in Ireland. Waterbodies can relate to surface waters (these include rivers, lakes, estuaries [transitional waters] and coastal waters) or to groundwater.

Waters from the proposed development will flow into Lough Conn. Lough Conn was designated a *Moderate* trophic status and a *Good* ecological status according to EPA sampling carried out in 2009.

5.3.4. Birds

5.3.4.1. Bird Atlases

The principal published sources of information regarding the distribution of breeding birds in Ireland are 'Bird Atlas 2007-11: The breeding and wintering birds of Britain and Ireland' (Balmer et al., 2013). Balmer et al. (2013) is the most recent comprehensive work on wintering and breeding birds in Ireland.

The atlas provides data for breeding and wintering birds respectively in individual 10 kilometre-by-10 kilometre squares (also known as hectads). The study area lies within two hectads, G11 and G12. Table 5.9 presents a list of species found in the relevant hectads, which are recorded in the most recent breeding bird atlases and are also protected under the EU Birds Directive or listed on the Birds of Conservation Concern in Ireland (2013) (BoCCI) red list (Colhoun & Cummins, 2013). Birds listed under Annex I are offered special protection by the EU Birds Directive. Those listed on the BoCCI red list meet one or more of the following criteria:

- IUCN: Global conservation status (Critically Endangered (CE), Endangered (E) or Vulnerable (V), but not Near Threatened. These species are recognised as the highest priorities for action at a global scale and are thus priorities at an all-Ireland level.
- European conservation status. The conservation status of all European species was assessed most recently by Birdlife International (2004), one of the main changes in the revision being to include the IUCN criteria. These species are those of global conservation concern (including those classified as Near Threatened) and are Red-listed.
- The Irish breeding population has undergone significant historical decline since 1800.
- The Irish breeding population or range has declined by 50% or more in the thirteen years from 1998-2011 (BDp1) or the 25 years from 1980-2013 (BDp2).
- The Irish non-breeding population has undergone a significant decline of 50% in the last 25 years.
- The Irish breeding range has undergone a decline of 70% or more in the last 25 years.

For the purposes of this desk study Meadow Pipit (*Anthus pratensis*) and Grey Wagtail (*Motacilla cinerea*) have not formed part of this assessment because both of these species (especially the former) are widespread and frequently encountered. They have recently (Colhoun and Cummins, 2013) been moved

from the BoCCI green list (low conservation concern) to the red list (high conservation concern). These two species were placed on the red list because their breeding populations declined by 50% or more over the 13-year period from 1998-2011 (BDp1). It is considered that these two species declined suddenly because of severe winters between 2009/10 and 2011/12. However, recent data from the Countryside Bird Survey (CBS) indicate that both of these species have been in recovery since 2011 (Crowe et al., 2014).

It should be noted that breeding was not proven in all instances where birds were recorded during the breeding atlas surveys, but also that the absence of a record does not necessarily imply that the species was absent from that square.

BD=Birds Directive; RL = BoCCI Red List; Seen = recorded; Breed = breeding; Non-B = non-breeding; Poss = possible breeding; Prob = probable breeding; Conf = confirmed breeding

Common Name	Scientific Name	Breeding Atlas 68-72		Breeding Atlas 88-91		Breeding Atlas 07-11		Conservation Status
		G11	G12	G11	G12	G11	G12	
Greater White-fronted Goose	*Anser albifrons*	Conf	Conf	Breeding	Breeding	Prob	Prob	BD
Dunlin	*Calidris alpina*	No	No	No	No	Non-breeding	No	BD, RL
Common Wood Pigeon	*Columba palumbus*	Conf	Conf	Breeding	Breeding	Prob	Prob	BD
Hen Harrier	Circus cyaneus	No	No	No	No	No	No	BD
Corncrake	*Crex crex*	Prob	Prob	Breeding	Seen	Poss	No	BD, RL
Whooper Swan	*Cygnus cygnus*	No	No	No	No	Non-breeding	No	BD
Merlin	*Falco columbarius*	Prob	No	No	No	No	No	BD
Peregrine Falcon	*Falco peregrinus*	No	No	No	No	No	Conf	BD
Common Snipe	*Gallinago gallinago*	Conf	No	Breeding	Breeding	Prob	Poss	BD

Common Name	Scientific Name	Breeding Atlas 68-72		Breeding Atlas 88-91		Breeding Atlas 07-11		Conservation Status
		G11	G12	G11	G12	G11	G12	
Great Northern Diver	*Gavia immer*	No	No	Seen	No	Non-breeding	No	BD
Common Pheasant	*Phasianus colchicus*	Conf	Prob	Breeding	Breeding	Poss	Prob	BD
Golden Plover	*Pluvialis apricaria*	No	No	No	No	Non-breeding	No	BD, RL
Common Tern	*Sterna hirundo*	Conf	No	Breeding	No	Poss	No	BD
Arctic Tern	*Sterna paradisea*	Prob	No	Breeding	No	No	No	BD, RL?
Sandwich Tern	*Sterna sandvicensis*	Conf	No	No	No	No	No	BD
Common Kingfisher	*Alcedo atthis*	Prob	Prob	No	No	Prob	No	BD
Mallard	*Anas platyrhynchos*	Conf	Conf	Breeding	Breeding	Conf	Poss	BD
Red Grouse	*Lagopus lagopus*	Conf	No	No	No	No	No	RL
Common Scoter	*Melanitta nigra*	Conf	No	Breeding	No	Poss	No	RL
Curlew	*Numenius arquata*	Poss	Poss	Seen	Breeding	Non-breeding	No	RL
Lapwing	*Vanellus vanellus*	Conf	Prob	Breeding	No	Conf	No	BD, RL
Pintail	*Anas acuta*	No	No	No	No	No	No	BD, RL
Northern Shoveler	*Anas clypeata*	Conf	No	No	No	No	No	BD, RL
Twite	*Carduelis flavirostris*	Poss	No	No	No	No	No	RL

Common Name	Scientific Name	Breeding Atlas 68-72		Breeding Atlas 88-91		Breeding Atlas 07-11		Conservation Status
		G11	G12	G11	G12	G11	G12	
Yellowhammer	*Emberiza citrinella*	Prob	Conf	Breeding	Breeding	No	No	RL
Herring Gull	*Larus argentatus*	No	No	Seen	No	No	No	RL
Black-headed Gull	*Larus ridibundus*	Conf	Poss	Breeding	No	Conf	No	RL
Jack Snipe	*Lymnocryptes minimus*	Na	Na	No	No	No	No	BD
Redshank	*Tringa totanus*	Poss	No	Breeding	No	Poss	No	RL
Barn owl	*Tyto alba*	No	No	No	No	Conf	Poss	RL
Woodcock	*Scolopax rusticola*	Prob	No	No	No	No	No	BD, RL
Common Goldeneye	*Bucephala clangula*	No	No	No	No	No	No	RL
Eurasian Wigeon	*Anas penelope*	No	No	No	No	No	No	RL
Common Pochard	*Aythya ferina*	No	No	No	No	No	No	RL

Table 5.9 Breeding Bird Atlas Data (Hectads G11 and G12)

Table 5.10 shows those species recorded in the relevant hectads (G11 an G12) in the wintering birds Atlases that are also protected under the EU Birds Directive, or mentioned on the Birds of Conservation Concern in Ireland (BoCCI) red list.

BD = EU Birds Directive Annex I; RL = BoCCI Red List; Pres = present in hectad; - = not recorded, Pres = Present in hectad, - = not recorded in hectad

Common Name	Scientific Name	Wintering Atlas 81-84		Wintering Atlas 07-11		Conservation Status
		G11	G12	G11	G12	
Greater White-fronted Goose	*Anser albifrons*	Pres	Pres	Pres	Pres	BD
Dunlin	*Calidris alpina*	Pres	No	Pres	No	BD, RL
Common woodpigeon	*Columba palumbus*	Pres	Pres	Pres	Pres	BD
Hen Harrier	*Circus cyaneus*	Pres	Pres	Pres	No	BD
Corncrake	*Crex crex*	Na	Na	No	No	BD, RL
Whooper Swan	*Cygnus cygnus*	Pres	No	Pres	No	BD
Merlin	*Falco columbarius*	No	No	No	No	BD
Peregrine Falcon	*Falco peregrinus*	No	No	Pres	No	BD
Common Snipe	*Gallinago gallinago*	No	Pres	Pres	Pres	BD
Great Northern Diver	*Gavia immer*	No	No	Pres	No	BD
Common Pheasant	*Phasianus colchicus*	Pres	Pres	Pres	No	BD
Golden plover	*Pluvialis apricaria*	No	No	Pres	No	BD, RL
Common Tern	*Sterna hirundo*	No	No	No	No	BD
Arctic tern	*Sterna paradisea*	No	No	No	No	BD, RL
Sandwich Tern	*Sterna sandvicensis*	No	No	No	No	BD
Common Kingfisher	*Alcedo atthis*	No	No	No	Pres	BD
Mallard	*Anas platyrhynchos*	Pres	Pres	Pres	No	BD
Red Grouse	*Lagopus lagopus*	No	No	No	No	BD, RL
Common Scoter	*Melanitta nigra*	No	No	Pres	No	BD, RL

Common Name	Scientific Name	Wintering Atlas 81-84		Wintering Atlas 07-11		Conservation Status
		G11	G12	G11	G12	
Curlew	*Numenius arquata*	Pres	Pres	Pres	No	BD, RL
Lapwing	*Vanellus vanellus*	Pres	Pres	Pres	Pres	BD, RL
Pintail	*Anas acuta*	No	No	No	No	BD, RL
Northern Shoveler	*Anas clypeata*	No	No	No	No	BD, RL
Twite	*Carduelis flavirostris*	No	No	No	No	RL
Yellow Hammer	*Emberiza citrinella*	No	Pres	No	No	RL
Herring Gull	*Larus argentatus*	No	Pres	No	No	RL
Black-headed Gull	*Larus ridibundus*	Pres	Pres	Pres	Pres	RL
Jack Snipe	*Lymnocryptes minimus*	No	No	No	Pres	BD
Redshank	*Tringa totanus*	Pres	No	Pres	No	RL
Barn owl	*Tyto alba*	No	No	No	No	RL
Woodcock	*Scolopax rusticola*	No	Pres	Pres	Pres	BD, RL
Grey Wagtail	*Motacilla cinereal*	Pres	Pres	Pres	Pres	RL
Meadow pipit	*Anthus pratensis*	No	Pres	Pres	Pres	RL
Goldeneye	*Bucephala clangula*	Pres	No	Pres	No	RL
Eurasian Wigeon	*Anas penelope*	Pres	No	Pres	No	BD, RL
Common Pochard	*Aythya ferina*	Pres	No	Pres	No	BD, RL

Table 5.10 Wintering Bird Atlas Data (Hectads G11 and G12)

BD = EU Birds Directive Annex I; RL = BoCCI Red List

Common Name	Scientific Name	Conservation Status	Hectad
Artic Tern	*Sterna paradisaea*	BD	G11
Barn Owl	*Tyto alba*	RL	G11, G12
Black-headed Gull	*Larus ridibundus*	RL	G11, G12
Common Kingfisher	*Alcedo atthis*	BD	G11
Common Pheasant	*Phasianus colchicus*	BD	G11, G12
Common Redshank	*Tringa totanus*	RL	G11
Common Scoter	*Melanitta nigra*	BD, RL	G11
Common Tern	*Sterna hirundo*	BD	G11
Common Wood Pigeon	*Columba palumbus*	BD	G11, G12
Corn Crake	*Crex crex*	BD, RL	G11, G12
Dunlin	*Calidris alpina*	BD	G11
Eurasian Curlew	*Numenius arquata*	BD, RL	G11, G12
European Golden Plover	*Pluvialis apricaria*	BD, RL	G11
Great Northern Diver	*Gavia immer*	BD	G11
Greater White-fronted Goose	*Anser albifrons*	BD	G11
Hen Harrier	*Circus cyaneus*	BD	G11
Herring Gull	*Larus argentatus*	RL	G11, G12
Mallard	*Anas platyrhynchos*	BD	G11, G12
Merlin	*Falco columbarius*	BD	G11
Northern Lapwing	*Vanellus vanellus*	BD, RL	G11, G12
Northern Pintail	*Anas acuta*	BD, RL	G11
Northern Shoveler	*Anas clypeata*	BD, RL	G11
Peregrine Falcon	*Falco peregrinus*	BD	G11, G12

Pink-footed Goose	*Anser brachyrhynchus*	BD	G11
Red Grouse	*Lagopus lagopus*	BD, RL	G11
Red-breasted Merganser	*Mergus serrator*	BD	G11
Sandwich Tern	*Sterna sandvicensis*	BD	G11
Twite	*Carduelis flavirostris*	RL	G11
Whooper Swan	*Cygnus cygnus*	BD	G11
Yellowhammer	*Emberiza citrinella*	RL	G11, G12
Common Snipe	*Gallinago gallinago*	BD	G12
Jack Snipe	*Lymnocryptes minimus*	BD	G12
Eurasian Woodcock	*(Scolopax rusticola*	BD	G12

Table 5.11 NBDC records for protected bird species records for hectads G11 and G12

5.3.5. Consultation

An informal scoping pack was sent to a range of statutory and non-statutory consultees during the preparing of this EIAR. A full list of consultees is provided in Section 2 of the EIAR. With particular reference to biodiversity, a written response was received from Inland Fisheries Ireland (IFI) on the 26th February 2018 and a meeting and walkover site visit was subsequently held on the 22nd March 2018. In addition, a meeting was held with representatives from the National Parks and Wildlife Service (NPWS) on the 21st March 2018 in the OPW offices in Headford to discuss the project. In addition, following the exhibition of the scheme in 2018, the IFI and NPWS both submitted written responses with observations in relation to the scheme as exhibited. As the scheme design had changed and additional elements were added, a briefing note, advising the IFI and Development Applications Unit of the Department of Culture, Heritage & the Gaeltacht of these changes was issued. In 2020, they were invited to comment on the changes to the scheme and the further hydrological and ecological studies undertaken and to make any further comment on the EIAR.. The IFI replied by email but no response was received from the NPWS at the time of writing.

All issues raised and advice provided has been taken into account in the preparation of this EIAR.

5.4. FIELD SURVEYS

5.4.1. Flora

The habitats present within the study area / footprint of the scheme are shown on the Habitat Map, Figure 5.3 and. are listed below. The habitat names are followed by their corresponding habitat reference code (in brackets). A detailed description of the region and its flora is also provided below.