

Proposed Discharge, Dawn Meats Ireland, Navan, Co. Meath (P21/424)



Aquatic Habitat, Macroinvertebrate and Otter Surveys, River Boyne

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Tait Business Centre, Dominic Street, Limerick City, Ireland.

t. +353 61 313519, f. +353 61 414315

e. info@ecofact.ie

w. www.ecofact.ie



SUMMARY

Ecofact Environmental Consultants Ltd. were commissioned by Dawn Meats / Panther Environmental Solutions to undertake a baseline aquatic survey of the River Boyne at Dollardstown, Co. Meath in relation to a proposed discharge. This report outlines the aquatic habitat, macroinvertebrate assemblages and Otter activity at a proposed discharge site. This survey was carried out in response to a submission from Inland Fisheries Ireland regarding the proposed development and its impact on the River Boyne at the outfall. The proposed discharge location is within the River Boyne and River Blackwater SAC and SPA. Several aquatic species are qualifying interests of the SAC including Atlantic Salmon, Brook Lamprey and Otter while Kingfisher are designated in the SPA.

A desk study was completed to identify the designated areas of protection on the River Boyne. A review of the current and historical water quality of the River Boyne was also undertaken. Aquatic ecology surveys were undertaken at two locations – one located downstream of the proposed discharge, and one located upstream. The aquatic survey included an aquatic habitat assessment of the entire 600m survey stretch, kick-sampling for macroinvertebrates and an Otter survey. Searches for rare / notable species (e.g. White-clawed crayfish and lampreys) at each site was also undertaken.

The River Boyne is part of the River Boyne and River Blackwater SAC and SPA. The river at the proposed discharge site is impounded by a weir downstream. Within the survey stretch is a mill race, Lugaree Weir, a cascade as well as riffle, glide and pool habitat. This is also where the Boyne navigation crosses from lock 16 to lock 14. The majority of the subject stretch is glide habitat with localised areas of riffle / cascade. On the northern bank there is a broadleaved woodland area covering most of the bank. The banks are low at both sides and mainly grass. While riffle, glide and pool are all present the substrate throughout is predominantly rock / cobble.

Regarding habitat present for fish species it is considered that any location in this survey stretch could be a holding place for adult Salmon. The only optimal lamprey juvenile nursery habitat is located c. 230m upstream of the proposed discharge location and upstream of Lugaree Weir. At the proposed discharge location there is siltation, but it is a thin layer and is not optimal lamprey habitat. In addition, the substrate present is predominantly rock / cobble and it is considered that the proportion of rock is too high for this to be suitable salmonid spawning habitat. In the area where the discharge is proposed there is no optimal lamprey spawning or nursery habitat. In addition, there is no optimal salmon spawning or nursery habitat. There are also no Otter holts in this area or any Otter features. Otters are present in the River Boyne and likely use the site to commute and forage.

Site 1 (downstream of the discharge) was rated Q3 equivalent to WFD status “Poor” based on the macroinvertebrate assemblages present. There were no pollutant sensitive Class A taxon recorded at Site 1. When considering the habitat present at the site however the Q-rating was increased to Q3-4 “Moderate”. In addition, there were no signs of pollution at the sign that warrant a Q3 rating. This was deep glide habitat with a predominantly rock / cobble substrate. Site 2 (upstream from discharge) was also rated Q3 equivalent to WFD status “Poor” based on the macroinvertebrate assemblages present. However, similar to Site 1 when the habitat present was taken into account this was increased to Q3-4.

In conclusion, the placement of the discharge in this location would not damage sensitive spawning habitat for Salmon or Lamprey. In addition, no Otter dwelling would be damaged.



TABLE OF CONTENTS

1. INTRODUCTION	4
2. METHODOLOGY	5
2.1 DESK STUDY	5
2.2 AQUATIC HABITAT SURVEY	5
2.3 AQUATIC MACROINVERTEBRATE SAMPLING	5
2.4 OTTER SURVEY	6
3. RESULTS	8
3.1 DESK STUDY	8
3.1.1 Catchment Overview	8
3.1.2 Aquatic Designated Areas	8
3.1.4 Water Quality	9
3.1.5 Aquatic Ecology	11
3.2 FIELD SURVEY	11
3.2.1 Aquatic Habitats	11
3.2.2 Macroinvertebrates	12
3.2.3 Otter Survey	13
6. CONCLUSIONS	17
REFERENCES	18
PLATES	19



1. INTRODUCTION

Ecofact Environmental Consultants Ltd. were commissioned by Dawn Meats / Panther Environmental Solutions to undertake a baseline aquatic survey of the River Boyne at Dollardstown, Co. Meath. This report outlines the aquatic habitat, macroinvertebrate assemblages and Otter activity at a proposed discharge site. This survey was carried out in response to a submission from Inland Fisheries Ireland regarding the proposed development and its impact on the River Boyne at the discharge. In this submission IFI outline the potential for sensitive habitats to be present in the subject area.

The proposed project involves the extension of an existing wastewater treatment plant (WWTP). This will include demolition works, construction of a new building and several upgrades to the WwTP. A treated wastewater rising main from the site of the proposed development to a new discharge point at the River Boyne (distance 7.2km) will be installed. The pipeline will be laid along a section of Windmill Road, the L1013, Yellow Furze Road, the L1600 (Boyne Road), and the unnamed local road leading from the L1600 to the private lands abutting the River Boyne at the discharge point (Shown in Figure 1.)

This report was prepared by Dr William O'Connor, a senior environmental scientist who has over 25 year's professional ecological management experience. He has a BSc in Marine Science from the National University of Ireland, Galway, an MSc in Applied Hydrobiology from the University of Wales, Cardiff, and a PhD in Zoology from National University of Ireland, Galway. He is a Fellow of the Society of Biology, and a full member of both the Chartered Institute of Ecology and Environmental Management and the Institute of Fisheries Management.



2. METHODOLOGY

2.1 Desk Study

A desktop study was undertaken to investigate several aquatic characteristics of the River Boyne and the surrounding environment. A desktop review was carried out to identify the most recent water quality of the River Boyne, the geographical characteristics of the site and designated areas of protection on the River Boyne. This involved accessing the National Biodiversity Data Centre (NBDC) (www.biodiversityireland.ie), their online maps and as well as the National Parks and Wildlife Service (www.npws.ie), the Environmental Protection Agency (www.gis.epa.ie/EPAMaps/) websites. Aerial imagery was also accessed online in order to gain a better understanding of the discharge site and its surrounding habitats in order to determine the biodiversity that was likely to be present prior to the development in question. The ecological assessment included designated and sensitive areas in the vicinity of the study area. Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) in the vicinity of the proposed development site were identified. This information was collated by accessing the NPWS website.

2.2 Aquatic Habitat Survey

An aquatic habitat survey was completed on two sites on the River Boyne. The survey stretch was located 300m upstream of Site 2 to 300m downstream of Site 1. The survey was completed with guidance from the Environment Agency's "*River Habitat Survey in Britain and Ireland Field Survey Guidance Manual 2003*" (EA, 2003) and "*A Guide to Habitats in Ireland*" (Fossitt, 2000) to help characterise the survey areas and adjacent landscape. Both sites were assessed in terms of:

- Stream width and depth and other physical characteristics
- Substrate type, listing substrate fractions in order of dominance, i.e., large rocks, cobble, gravel, sand, mud etc.
- Flow type, listing percentage of riffle, glide and pool in the sampling area
- Instream vegetation, and percentage coverage of the stream bottom at the sampling site (as applicable) and on the bankside
- Estimated cover by bankside vegetation, giving percentage shade of the sampling site

2.3 Aquatic Macroinvertebrate Sampling

Qualitative sampling of benthic (or bottom dwelling) macroinvertebrates was undertaken at the survey sites using kick-sampling (Toner et al., 2005). This procedure involved the use of a 'D' shaped hand net (mesh size 0.5 mm; 350 mm diameter) which was submerged on the riverbed with its mouth directed upstream. The substrate upstream of the net was then kicked for one minute in order to dislodge invertebrates, which were subsequently caught in the net. This procedure was undertaken at three points along/across the watercourse. Vegetation sweeps were also undertaken over a further 1-minute period to ensure a representative sample of the fauna present at the site was collected. Specific sweep netting assessments were completed to determine presence / absence of White-clawed crayfish and juvenile lamprey species.

Macroinvertebrates provide an estimation of the current health of the waterbody and the type of substrate. They are divided into 5 categories (A, B, C, D, E – "A" being the most sensitive and "E" being the most tolerant). A desk study was completed and used resources such as the NBDC species maps to identify if any rare/protected species have been recorded in the area. The areas were assessed, and



a suitable site was discussed for Survey Site 1 and 2. Each sample was placed on a tray and assessed together. Families were recorded with their relative abundance on site.

All samples of invertebrates were combined for each site and live sorted on the riverbank and fixed in ethanol for subsequent laboratory identification. The relative abundance of macroinvertebrates was recorded on-site at each site. Further identification was undertaken in the laboratory using a stereoscope.

Table 1 Relationship between Q-value and Ecological Status for macroinvertebrates.

Q Value*	WFD Status	Pollution	Condition**
Q5, Q4-5	High	Unpolluted	Satisfactory
Q4	Good	Unpolluted	Satisfactory
Q3-4	Moderate	Slightly polluted	Unsatisfactory
Q3, Q2-3	Poor	Moderately polluted	Unsatisfactory
Q2, Q1-2, Q1	Bad	Seriously polluted	Unsatisfactory

* These values are based primarily on the relative proportions of pollution sensitive to tolerant macroinvertebrates (the young stages of insects primarily but also snails, worms, shrimps etc.) resident at a river site.

** "Condition" refers to the likelihood of interference with beneficial or potential beneficial uses

2.4 Otter Survey

A specific otter survey was carried out in accordance with the Scottish Natural Heritage Guidelines "Protected Species Advice for Developers – Otter" and "Guidelines for the treatment of otters prior to the construction of national road schemes". The Scottish Natural Heritage guidelines state that suitable habitat 200m upstream and downstream of the development should be surveyed

The otter survey was carried out during optimal conditions. In total all suitable habitat 250m upstream was surveyed and all suitable habitat 250m downstream was assessed for signs of otter including spraints, couches, holts, tracks and trails.

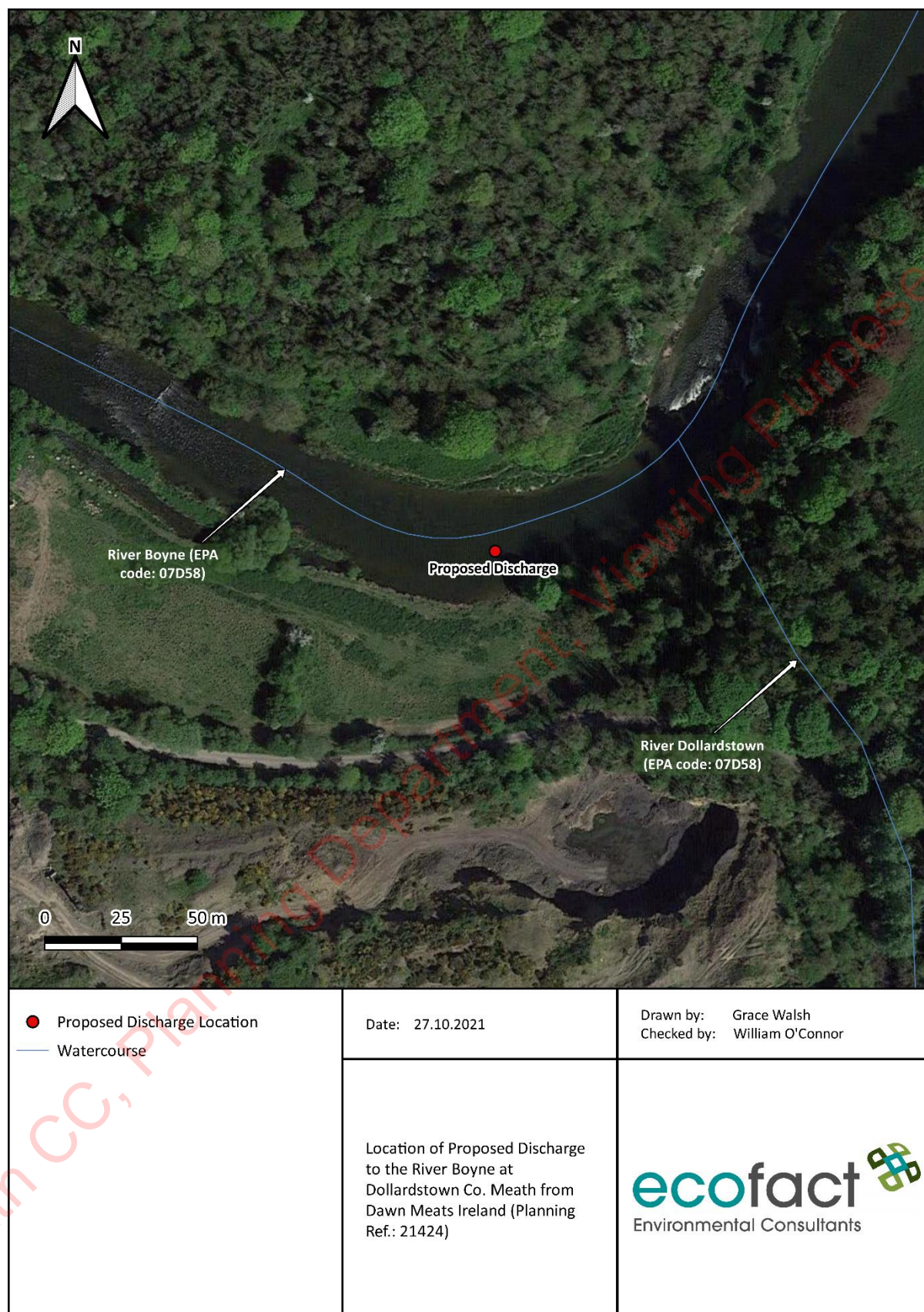


Figure 1. Location of Proposed Discharge to the River Boyne at Dollardstown, Co. Meath from Dawn Meats Ireland (Planning Ref.: 21424)



3. RESULTS

3.1 Desk Study

3.1.1 Catchment Overview

The proposed pipeline will discharge into the 6th order River Boyne (EPA code: 07B04). This is c. 7.2km downstream of Navan, Co. Meath.

The River Boyne rises in Edenderry, County Kildare and flows in a north-easterly direction as far as Trim, Co. Meath. At this point it is a 6th order river having been joined by the 4th order River Yellow [Castlejordan] (EPA code: 07Y02), the 3rd order River Kinnegad 07 (EPA code: 07K01) and the 5th order River Deel [Raharney] (EPA code: 07D01), the 3rd order River Stonyford 07 (EPA code: 07S02) and the 4th order River Athboy (EPA code 07A01) just upstream of Trim. The River Boyne then flows easterly through Trim before turning north / northeast towards Navan and is joined by the 4th order River Claddy (Meath) (EPA code: 07C01) and River Skane (EPA code: 07S01). At Navan the River Boyne is joined by the 5th order River Blackwater [Kell] (EPA code: 27B01). The river flows northeast and turns east at Slane Castle, County Meath. The river becomes a transitional waterbody at Proudfootstown in County Meath, between the Dowth wetland NHA and the 4th order Mattock River (Segment Code: 07_2151) confluence with the Boyne.

There are a series of canals which run along the River Boyne as part of the Boyne Navigation. This canal crosses the River Boyne upstream of the site. There are two Stackahallan Locks on either side of the bank where this occurs directly upstream of Lugaree Weir.

There is also a former mill at the site here. This mill has resulted in some morphological changes to the river with the creation of a mill race. According to the OSI historical map this predates 1829.

3.1.2 Aquatic Designated Areas

The stretch of the River Boyne where the proposed discharge will be located is a Salmonid water designated pursuant to the European Communities (Quality of Salmonid Waters) Regulations, 1988, (S.I. No. 293 of 1988).

The subject stretch of the River Boyne is also a nutrient sensitive water. Such waters comprise nitrate vulnerable zones designated under the Nitrates Directive (91/676/EEC) and areas designated as sensitive under the Urban Wastewater Treatment Directive (91/271/EEC).

The River Boyne at this site is also within the River Boyne and Blackwater SAC (000299) and the River Blackwater SPA (004232). These are areas designated for the protection of habitats or species where the maintenance or improvement of the status of water is an important factor in their protection. These are designated under the Habitats Directive (92/43/EEC) and the Birds Directive (79/409/EEC) respectively. The River Boyne and River Blackwater SAC comprises of the freshwater part of the River Boyne and the River Blackwater and some of the other major tributaries of the Boyne.

The River Boyne and River Blackwater SAC is selected for Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*) (91E0) as well as for Alkaline fens (7230) which are listed in Annex I of the E.U. Habitats Directive, 1992. Alluvial wet woodland habitat is a priority habitat on Annex I of the Directive. Priority habitats are those which are considered to require particular protection because their global distribution largely falls within the E.U. and they are in danger



of disappearance. As well as for these habitats, the SAC has been selected for fish and mammal species which are listed under Annex II of the EU Habitats Directive. These species are River Lamprey *Lampetra fluviatilis* (1099), Atlantic Salmon *Salmo salar* (1106) and Eurasian Otter *Lutra lutra* (1355).

The River Boyne and River Blackwater SPA is selected for the protection of Kingfisher *Alcedo atthis* (A229) listed under Annex II of the E.U. Birds Directive.

3.1.4 Water Quality

There were 14 EPA monitoring stations on the River Boyne in 2020. In 2020 the EPA described the river as “Five of the fourteen stations on the Boyne were in satisfactory condition when assessed in 2020 (0400, 0800, 0900, 2100 and 2200). One site declined in quality, Kinnafad Bridge (0300), which is now of poor ecological status. All other sites were of moderate ecological status.”

Approximately 5.7rkm downstream from the proposed discharge location there is an EPA monitoring station (RS07B042100) at Slane. This site was rated Q4 in 2020 equivalent to WFD status “Good”. The next upstream monitoring station (RS07B042010) is located directly downstream of the proposed discharge location. This site was rated Q3-4 in 2020 equivalent to WFD status “Moderate”. Approximately 5.2rkm upstream from there is an EPA monitoring station (RS07B041900) rated Q3-4 in 2003, the same as a site (RS07B041800) a further 2.6 rkm upstream. Upstream from here by c. 2.3rkm upstream an EPA monitoring station (RS07B041700) was rated Q3-4 in 2020.

At the proposed discharge location, the river is considered an “At Risk” waterbody. There are significant pressures on the river at the site including unknown anthropogenic pressures and domestic wastewater. The sub-catchment is under pressure from urban and domestic wastewater, industry, channalisation, and agriculture including farmyards and pastures (WFD, 2018).

The closest upstream WwTP is at Navan. This WwTP was compliant with all emission limit values in 2020 (Irish Water, 2020).

Table 2 EPA Q-ratings for the River Boyne from 2006 to 2020.

Station code	2006	2007	2008	2009	2012	2014	2015	2018	2020
RS07B040200	4			4	3-4	3-4	3-4	3-4	3-4
RS07B040300	3-4			3-4	3-4		3-4	3-4	3
RS07B040400	4			4	4			3-4	4
RS07B040600	3-4			3-4	3-4		3-4	3-4	3-4
RS07B040800	4			4-5	4		4-5	4	4
RS07B040900	4				3-4		3-4	4	4
RS07B041000	4			4	4		4	3-4	3-4
RS07B041200	4			3-4	3-4		3-4	3-4	3-4
RS07B041400	4			3-4	3-4		3-4	3-4	3-4
RS07B041500	3-4			3-4	3-4		3-4	3-4	3-4
RS07B041700	3-4			3-4	3-4		3-4	4	3-4
RS07B042010	3-4			3-4	4		3-4	3-4	3-4
RS07B042100	3-4	3-4	3-4	4	4		3-4	4	4
RS07B042150	3-4			4	4				
RS07B042200	3-4			3-4	3-4		4	4	4

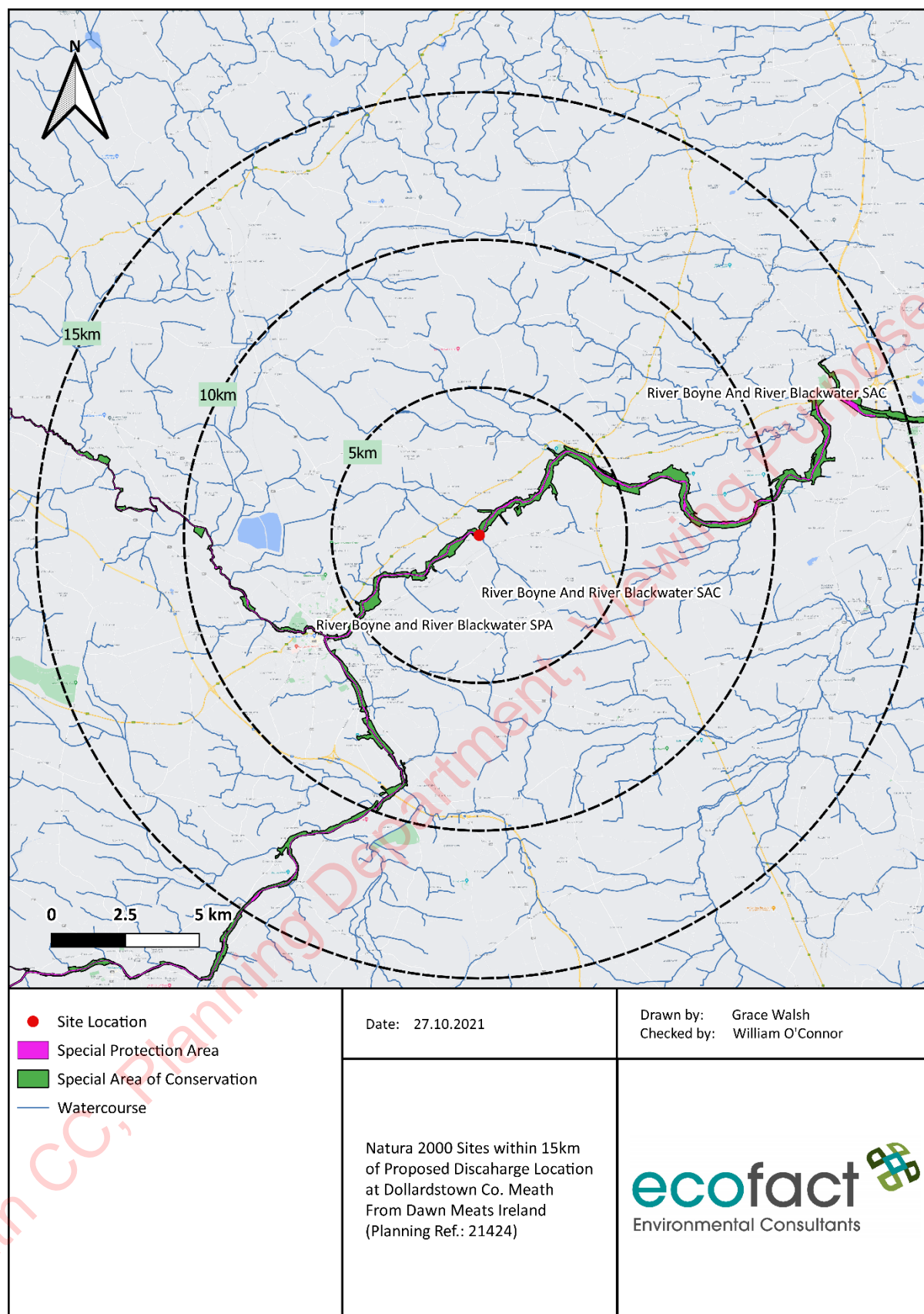


Figure 2 Natura 2000 Sites within 15km of Proposed Discharge Location at Dollardstown, Co. Meath from Dawn Meats Ireland (Planning Ref.: 21424)



3.1.5 Aquatic Ecology

The most recent national otter survey was carried out in 2010/2011. The results of this survey for the River Boyne are not available on the NBDC maps, however it appeared that otter populations in the River Boyne are increasing although this was not significant. According to the NBDC maps there are several records of Otter from the area. The closest record is from just upstream at Broadboyne Bridge and is from 1980. Otter have been recorded at Slane Bridge in 2008-2014. This is c. 5.6km downstream of the proposed discharge site. The River Boyne and River Blackwater SAC is designated for Otter and Otter are present throughout the site (NPWS, 2014).

The submission from Inland Fisheries Ireland regarding the proposed development details the fish species present in this area. It details the fish species present. It states there is a good abundance of Atlantic Salmon fry in the river. The River Boyne is also very important for European eel. All three Irish Lamprey species could also be present in the subject stretch. The SAC is designated for one lamprey species which is the River Lamprey *Lampetra fluviatilis*. Brook Lamprey are also present throughout the catchment and Sea Lamprey have been recorded spawning in the lower sections (IFI, 2021). A larval lamprey survey was undertaken on the catchment in 2005 at the site of the new slipway shown in Figure 3. This was site B4 in the O'Connor (2006) lamprey survey of the River Boyne. Lamprey habitat at this site has been damaged by the construction of this slipway. Previously there were high densities of juvenile River/Brook lamprey here.

3.2 Field Survey

3.2.1 Aquatic Habitats

The subject stretch of the river Boyne is c. 600 m in length. Throughout the entire survey stretch there is very low canopy cover of c. 0-5%. The width of the river throughout is c. 35m. The habitat here is Depositing/lowland rivers (FW2). Starting c. 300 m downstream of the proposal discharge location the river habitat is glide. This is an intermediate habitat between pool and glide where pool habitat is almost still and riffle is fast flowing turbulent water. At both banks there is a high-density of in stream vegetation consisting of reeds. In some areas the density of Rees's lesson and they give way to grass. On both banks as you move away from the river there is forestry present consisting of broadleaved woodland. The water here is quite deep and the substrate is predominantly rock/cobble. Kick sampling Site 1 was located in this area. The glide habitat here is created by a weir c. 600m downstream which impounds the river upstream of that point.

Approximately 120m downstream from the proposed discharge location there is cascade habitat. The water in this area flows relatively fast for c. 30m and is cascade / riffle habitat with a predominantly rock substrate. On either bank here there is woodland. At this location the 2nd order River Dodderstown flows into the River Boyne. This stream runs adjacent to a historical quarry (as viewed on the GSI Quarry Directory maps). It also appears from viewing aerial photography that there is an active quarry c. 80m from the proposed discharge location. This quarry is not listed on the Active Quarry & Pits Ireland database. Due to this it appears that it is an unlicensed active quarry. The stream was visibly polluted during the survey.

At the proposed discharge location there is a 100m stretch of river which is deep pool habitat. The substrate here is rock/cobble. The woodland also encroaches on to these banks but there is a larger grassy area particularly on the northern bank. There then is a very large grassy area on the



south bank where the woodland ends. There were signs of eutrophication at the proposed discharge location with high levels of siltation in addition to algal and bacterial growths.

Immediately upstream of the proposed discharge location was survey Site 2. This whole area is glide habitat with a predominantly rock / cobble substrate. The north bank in this location is broadleaved woodland. There is no woodland on the south bank here and it is an open grass area. Also present here is the beginning of the mill race which is a part of the former a mill building which is present just upstream. The mill race is glide habitat and is c. 178m in length. Approximately 50m upstream from Site 2 is a small section of riffle habitat. Directly upstream from here is again glide habitat and the mill race ends here. During the current survey there was a high proportion of submerged instream vegetation in this area. The mill race and the main channel of the River Boyne are separated by a long in stream island.

Directly upstream of the mill building is Lugaree Weir. This is also where the Boyne navigation crosses from lock 16 to lock 14. This substrate here was again predominantly rock / cobble. This weir has resulted in the river directly upstream being pool habitat for c. 80m. On the southern bank of this area there is optimal juvenile lamprey habitat in the form of silt beds. On the north bank is the end of the woodland habitat in that area. The water here is quite deep and a new slipway has been constructed into the lamprey nursery habitat which has damaged some of the silt beds in this area.

Regarding habitat present for fish species it is considered that any location in this survey stretch could be a holding place for adult Salmon. As stated, the only optimal lamprey juvenile habitat is located c. 230m upstream of the proposed discharge location. At the proposed discharge location there is siltation but it is a thin layer and is not optimal lamprey habitat. In addition, the substrate present is predominantly rock / cobble and it is considered that the proportion of rock is too high for this to be suitable salmonid spawning habitat.

3.2.2 Macroinvertebrates

3.2.2.1 Site 1

Site 1 was deep glide habitat with a predominantly rock / cobble substrate. This site was located c. 200m downstream of the proposed discharge location.

There was a total of 24 macroinvertebrates recorded at Site 1. There were no pollutant sensitive Group A species recorded at this site. Group B macroinvertebrates are also pollutant sensitive and there were 5 recorded at Site 1. These included the cased caddisfly larvae *Halesus* sp. and *Agrypnia* sp. which were recorded as present and in small numbers respectively. Another Group B cased caddisfly larvae Hydroptilidae was present in small numbers. The Banded demoiselle *Calopteryx splendens* was present in small numbers and the true bug *Aphelocheirus aestivalis* in common numbers.

Group C was the highest represented group with 15 taxa recorded. Group C taxa recorded as present was the water boatman *Sigara* sp. There was one mayfly larvae *Ephemerella ignita* recorded in scarce/few numbers. Also present in scarce/few numbers were the caseless caddisfly larvae *Polycentropus kingi*, the black fly larvae Simuliidae, the snail *Planorbis carinatus* and the lesser water boatman *Corixa punctata*. There were three Group C taxa recorded in small numbers. These were the caseless caddisfly larvae *Hydropsyche* spp., the water beetle *Halipus* sp. and the snail *Bithynia tentaculata*. There were four Group C taxa recorded in fair numbers. These were the caseless caddisfly



larvae *Rhyacophila dorsalis*, Green chironomid, the beetle *Gyrinus substriatus* and the water strider *Gerris* sp. Lastly, there were two other Group C taxa recorded which were the mayfly larvae *Baetis rhodani* and the crustacean *Gammarus* spp. There were three pollutant tolerant Group D species recorded. These were the earthworm Lumbricidae which was recorded as present, the water mite Hydracarina in small numbers and *Asellus aquaticus* present in fair numbers.

With regard to the macroinvertebrate assemblage recorded at the site a Q-rating of Q3 was assigned equivalent to WFD status “Poor”. However, when considering the overall habitat at the site it was rated Q3-4 equivalent to WFD status “Moderate”.

3.2.2.2 Site 2

Site 2 was also glide habitat with a predominantly rock / cobble substrate. This site was located c. 200m downstream of the proposed discharge location. There was a total of 27 macroinvertebrate families recorded at Site 2. There were no pollutant sensitive Group A species recorded at this site. Group B macroinvertebrates are also pollutant sensitive and there were 5 of these recorded at Site 1. These included the cased caddisfly larvae *Halesus* sp. and *Agrypnia* sp. which was recorded as present and in small numbers respectively. Another Group B cased caddisfly larvae Hydroptilidae was present in small numbers. The Banded demoiselle *Calopteryx splendens* was present in small numbers and the true bug *Aphelocheirus aestivalis* in common numbers.

Group C was the highest represented group with 16 taxa recorded. There were three taxa recorded as present which were the mayfly larvae *Ephemera ignita*, the caseless caddis fly larvae *Polycentropus kingi* and the water beetle *Nebrioporus depressus elegans*. Present in scarce/few numbers were the caseless caddisfly larvae *Rhyacophila dorsalis*, the crane fly larvae Tipulidae, the snail *Planorbis carinatus* and the lesser water boatman *Corixa punctata*. There were three Group C taxa recorded in small numbers which were the caseless caddisfly larvae *Hydropsyche* spp., the black fly larvae Simuliidae and the snail *Bithynia tentaculata*. Group C taxa recorded in fair numbers included green chironomid, the beetles *Gyrinus substriatus* and *Halipus* sp. and the water strider *Gerris* sp. Lastly there were two taxa recorded in common numbers which were the mayfly larvae *Baetis rhodani* and the crustacean *Gammarus* spp. There were four Group D species recorded at the site. Group D taxa recorded as present the leeches *Erpobdella octoculata* and *Glossiphonia complanata*. Also present were the Group D water mite Hydracarina and *Asellus aquaticus* were present in fair numbers. There was also one Group E species recorded as present which was *Chironomus* sp.

With regard to the macroinvertebrate assemblage recorded at the site a Q-rating of Q3 was assigned equivalent to WFD status “Poor”. However, when considering the overall habitat at the site it was rated Q3-4 equivalent to WFD status “Moderate”.

3.2.3 Otter Survey

An extensive search for Otter was carried out c. 250m downstream and 250m upstream of the proposed discharge location. There were no signs of otter recorded during the current survey and it is considered that the current survey was carried out during optimum service conditions. No Otter features such as slides, or couches were recorded. In addition, no otter holts were recorded. The bank and the areas back from the bank including the woodland were also surveyed for potential Otter signs and none were found.

While there are no holts present in this stretch Otter would use this area to commute up and downstream and also to forage.

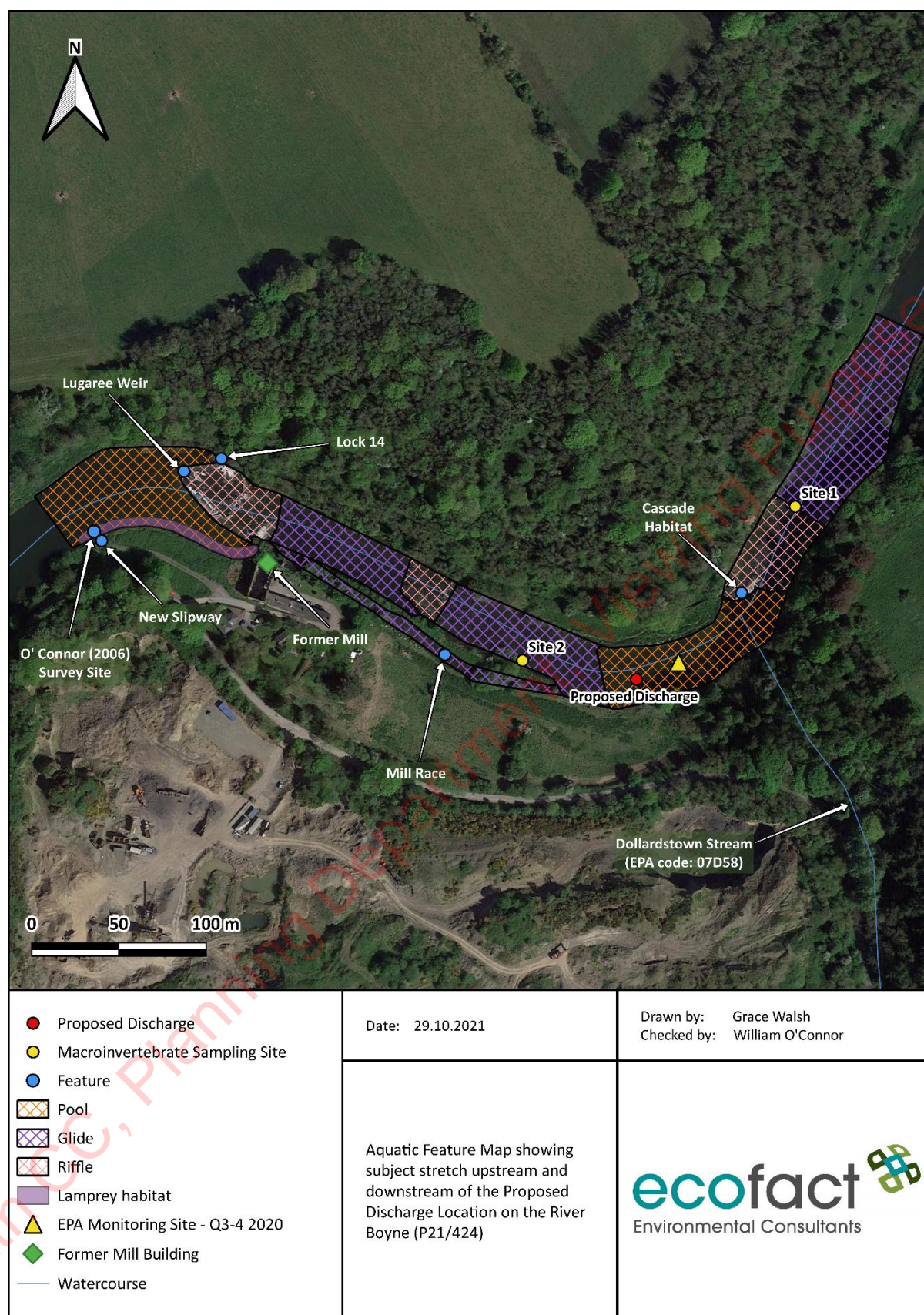


Figure 3 Aquatic Feature Map showing subject stretch upstream and downstream of the Proposed Discharge Location on the River Boyne (P21/424)



Table 3 Results of the on-site macroinvertebrate survey at the two survey sites on the River Boyne during July 2021.

	Pollution sensitivity group	Site 1 (Downstream)	Site 2 (Upstream)
MAYFLIES (Ephemeroptera)			
Family Ephemerellidae			
<i>Ephemerella ignita</i>	C	**	*
Family Baetidae			
<i>Baetis rhodani</i>	C	*****	*****
CASED CADDIS FLIES (Tricoptera)			
Family Limnephilidae			
<i>Halesus</i> sp.	B	*	*
Family Sericostomatidae			
<i>Agrypnia</i> sp.	B	***	***
Family Hydroptilidae	B	***	***
CASELESS CADDIS FLIES (Trichoptera)			
Family Hydropsychidae			
<i>Hydropsyche</i> spp.	C	***	***
Family Rhyacophilidae			
<i>Rhyacophila dorsalis</i>	C	****	**
Family Polycentropodidae			
<i>Polycentropus kingi</i>	C	**	*
TRUE FLIES (Diptera)			
Family Tipulidae	C		**
Family Chironomidae			
<i>Chironomus</i> sp.	E		*
Green chironomid	C	****	****
Family Simuliidae	C	**	***
DAMSELFLIES (Odonata, Zygoptera)			
Family Zygoptera			
<i>Calopteryx splendens</i>	B	***	***
BEETLES (Coleoptera)			
Family Gyrinidae			
<i>Gyrinus substriatus</i>	C	****	****
<i>Halplus</i> sp.	C	***	****
Family Dytiscidae			
<i>Nebrioporus depressus elegans</i>	C		*
MOLLUSCS			
Family Planorbidae			
<i>Planorbis carinatus</i>	C	**	**
Family Hydrobiidae			
<i>Bithynia tentaculata</i>	C	***	***
CRUSTACEANS (Crustacea)			
Amphipods (Amphipoda, Gammaridae)			
<i>Gammarus</i> spp.	C	*****	*****
Isopods, Asellidae			
<i>Asellus aquaticus</i>	D	****	****
LEECHES (Hirudinae)			
Erpobdellidae			
<i>Erpobdella octoculata</i>	D		*
Glossiphoniidae			
<i>Glossiphonia complanata</i>	D		*
BUGS (Hemiptera)			
Family Veliidae	C		
<i>Velia</i> sp.		****	**
<i>Gerris</i> sp.	C	****	****
Family Aphelocheiridae			
<i>Aphelocheirus aestivalis</i>	B	*****	*****
Family Corixidae			



	Pollution sensitivity group	Site 1 (Downstream)	Site 2 (Upstream)
<i>Corixa punctata</i>	C	**	**
<i>Sigara sp</i>	C	*	
SPIDERS (Crustacea, Arachnida)	C		
Order Hydracarina <i>Hydrachna sp.</i>	D	***	****
SEGMENTED WORMS (Annelida, Clitellata)			
Lumbricidae	D	*	
Number of families		24	27
Q-Rating (based on scores)		Q3	Q3
Algae / bacterial growths		Moderate	Moderate
Siltation		Moderate	Moderate
Habitat type		Glide	Glide
Q-Rating (based on scores, habitats)		Q3-4*	Q3-4*

Note. * = <1%, ** = <5%, *** = 5-10%, **** = 10-20%, ***** = 25-50%, **** = 50-75%, and ***** = >75%.



6. CONCLUSIONS

This assessment was undertaken to describe the aquatic habitat of the River Boyne in addition to an assessment of water quality and Otter activity.

The River Boyne is part of the River Boyne and River Blackwater SAC and SPA. The river at the proposed discharge site is impounded by a weir downstream. There is also a mill race present directly upstream in addition to Lugaree Weir. This is also where the Boyne navigation crosses from lock 16 to lock 14. The majority of the subject stretch is glide habitat with localised areas of riffle / cascade. On the northern bank there is a broadleaved woodland area covering most of the bank. The banks are low at both sides and mainly grass. While riffle, glide and pool are all present the substrate throughout is predominantly rock / cobble.

Regarding habitat present for fish species it is considered that any location in this survey stretch could be a holding place for adult Salmon. As stated, the most ideal lamprey juvenile habitat is located c. 230m upstream of the proposed discharge location. This area was previously surveyed by O' Connor (2005) which found relatively high juvenile lamprey densities at the site. The water here is quite deep, and a new slipway has been constructed into the lamprey habitat which has damaged some of the habitat in this area.

At the proposed discharge location there is siltation, but it is a thin layer and is not optimal lamprey habitat. In addition, the substrate present is predominantly rock / cobble and it is considered that the proportion of rock is too high for this to be suitable salmonid spawning habitat. In the area where the discharge is proposed there is no optimal lamprey spawning or nursery habitat. In addition, there is no optimal salmon spawning or nursery habitat. There are also no Otter holts in this area or any Otter features. Otters are present in the River Boyne and likely use the site to commute and forage.

Site 1 (downstream of the discharge) was rated Q3 equivalent to WFD status "Poor" based on the macroinvertebrate assemblages present. There were no pollutant sensitive Class A taxon recorded at Site 1. When considering the habitat present at the site however the Q-rating was increased to Q3-4 "Moderate". In addition, there were no signs of pollution at the site that warrant a Q3 rating. This was deep glide habitat with a predominantly rock / cobble substrate. Site 2 (upstream from discharge) was also rated Q3 equivalent to WFD status "Poor" based on the macroinvertebrate assemblages present. However, similar to Site 1 when the habitat present was taken into account this was increased to Q3-4.

In conclusion, the placement of the discharge in this location would not damage sensitive spawning habitat for Salmon or Lamprey. In addition, no Otter dwelling would be damaged.



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PLATES



Plate 1 The River Boyne c.200m downstream of the proposed discharge location, July 2021. This is deep glide habitat with a predominantly rock / cobble substrate. This was kick sampling site 1.



Plate 2 The River Boyne c.100m downstream of the proposed discharge location, July 2021. This is riffle / cascade habitat with a predominantly rock substrate.



Plate 3 The River Boyne at the proposed discharge location, July 2021. This is pool habitat with a predominantly rock / cobble substrate.



Plate 4 The River Boyne at the proposed discharge location (alternative view).

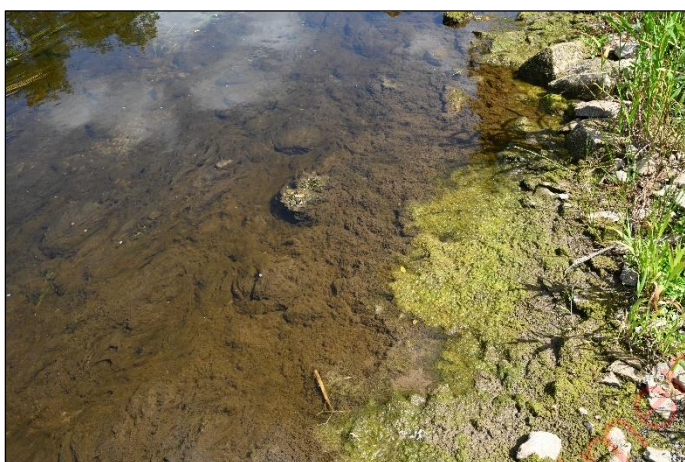


Plate 5 The River Boyne at the proposed discharge location showing signs of eutrophication (algal and bacterial growths, siltation).



Plate 6 The River Boyne immediately upstream of the proposed discharge location, July 2021. This is pool habitat with a predominantly rock / cobble substrate. This was kick sampling Site 2.



Plate 7 The River Boyne c.100m upstream of the proposed discharge location, July 2021. This is glide habitat with a predominantly rock / cobble substrate.



Plate 8 Lugaree Weir located on the River Boyne c.200m of the proposed discharge location. The substrate here is again dominated by rock / cobble.



Plate 9 New slipway on the River Boyne c.250m upstream of the proposed discharge location, July 2021. This stretch of river has deep pool habitat impounded by the weir. Silt has built up in this area providing juvenile lamprey habitat. This was site B4 in the O'Connor (2006) lamprey survey of the River Boyne. Lamprey habitat at this site has been damaged by the construction of this slipway.



Plate 10 Banded Demoiselle *Calopteryx splendens* at the proposed outfall location, July 2021.



Plate 11 Juvenile European eel *Anguilla anguilla* recorded during the kick sampling survey, July 2021.



Plate 12 Cormorant *Phalacrocorax carbo* flying past at the proposed outfall location, July 2021.