Appendix 7-5c- Electrofishing and Macroinvertebrate Surveys (STILL WATERS CONSULTANCY)

ELECTRO-FISHING AND MACROINVERTEBRATE SURVEYS ON RIVER SITES

IN THE DERRYADD AREA CO.LONGFORD

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1. INTRODUCTION

Stillwaters Consultancy was commissioned by Tobin Engineering Consultants to carry out:

1) An electro-fishing survey on 12 sites previously chosen by Tobin for a macroinvertebrate survey.
2) Observations on the Fishery Value of these streams at the chosen sites.
3) Macroinvertebrate samples from these sites.
4) The status of Otters from observations at the sites.

The sites covered 5 rivers or streams, see Figure 1.1

The Lough Bannow Stream and the Ballynakill River are not marked on the Ordnance Survey Ireland (OSI), Discovery Series, No. 40 but are designated on the EPA database.

- The Ballynakill (sites 3, 4, 10 and 11) runs North entering the River Shannon above Lanesborough.
- The Loughbannow Stream, (sites 2, 7, 6 and 8) is a similar sized stream flowing North and enters the River Shannon just above Lough Ree.
- Survey sites 1 and 12 are near the source of the Ledwithstown River to the South.

Downstream the river is designated as the Bilberry River on the OSI map, No.40.

- Survey site 5, is a tributary of the Fallan river which flows North to join the Camlin River.
- Site 9 is on an unnamed stream draining the bog north of Lanesborough and enters the Shannon through Kilnacarrow wood.

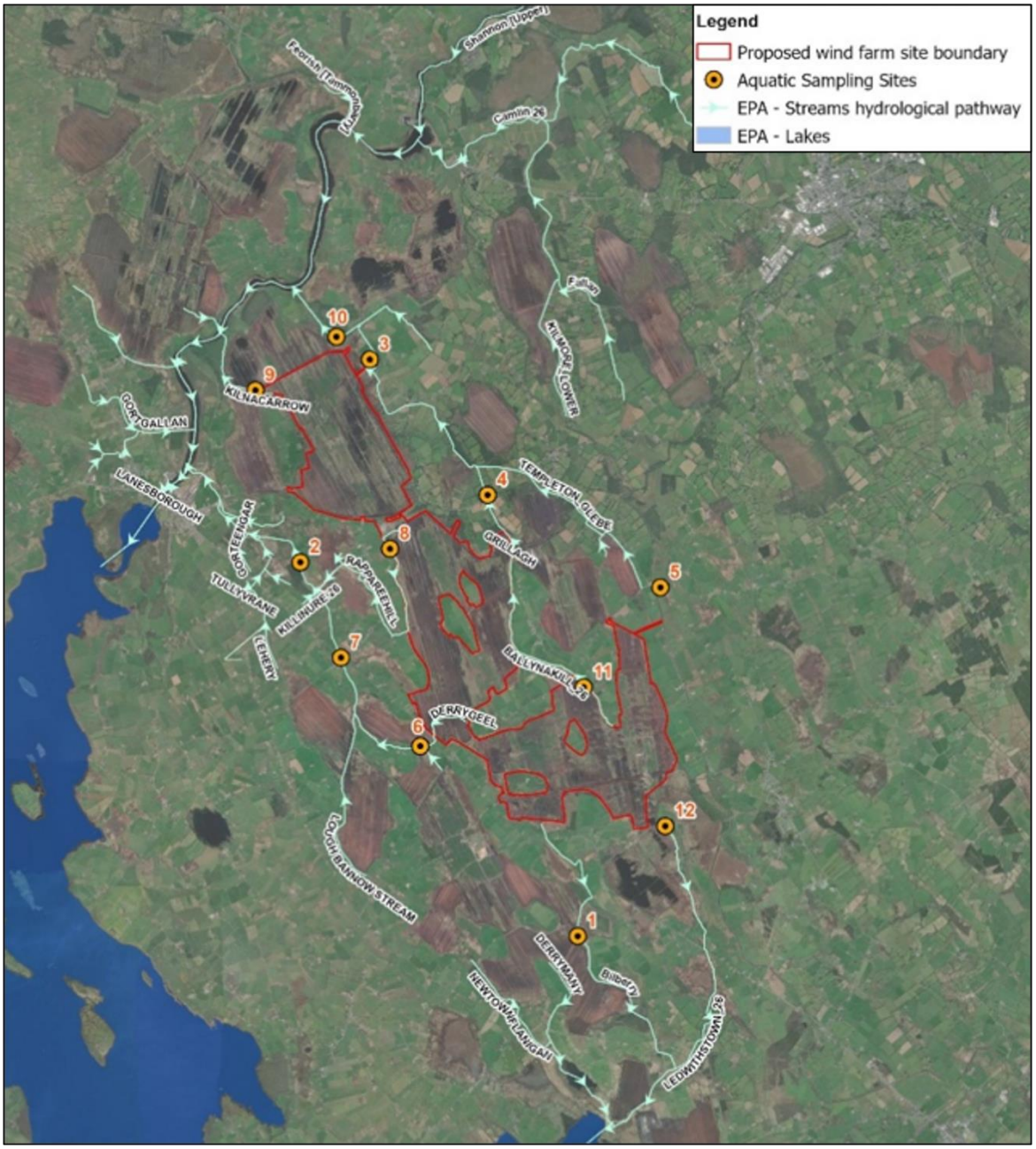

Figure 1.1: Sampling Sites

2. MATERIALS AND METHODS

Where possible the sites were electro-fished and assessments of the fishery value of the sites were made. A macroinvertebrate sample taken, and the area around each site was examined for signs of otter activity.

2.1 Electro-fishing

A timed (10 minute) electro-fishing method (Matson et al., 2017) was used. Timed surveys were carried out at sites 2, 3, 4, 5 and 10. It did not prove possible to provide timed surveys at other sites because of their physical nature.

Sites 1, 6, 7, 8 and 12 were unsuitable because there was no open water and/or little flow due to excessive instream vegetation, but spot fishing was carried out in isolated pockets. There was excessive depth over a soft substrate at site 11, so wading was not possible. Site 9 had no areas suitable for electro-fishing.

The electro-fishing equipment used was a Smith-root LR-24 portable electro-fisher backpack. The settings used were 40 Hertz @250volts with a 18% duty cycle. Fishing was carried out moving upstream.

2.2 Fishery value

The fishery value of the sites was assessed based on results from electro-fishing, the substrate, depths, flows and bank configuration. The sequences of riffle and deep flow and the presence of instream vegetation was a major consideration.

2.3 macroinvertebrate fauna.

Aquatic invertebrates provide information on the quality of the river water. Aquatic invertebrates are divided into 5 'Indicator Groups' based on their sensitivity to pollution:

- Group A- Very Sensitive
- Group B -Sensitive
- Group C- Tolerant
- Group D -Very Tolerant
- Group E -Most Tolerant

Macro-invertebrate samples were converted to Q-ratings as per Toner et al. (2005). All riverine samples were taken with a standard kick sampling hand net (250mm width, 500µm mesh size) from areas of riffle/glide utilising a three-minute sampling effort. This included the washing of large cobble and or small boulder at each survey site.

Kick samples were taken at the 12 sites and Q values determined. The samples were live sorted and identified to family level, Appendix A.

2.4 Otters

Otters[1] maintain territories and will defend their stretches of riverbank or lake shore from other otters. In lowland rivers otters only need to maintain small territories (1- 2km), but on smaller or less productive rivers where food tends to be less abundant, otter territories need to be larger.

An otter usually maintains numerous couches and holts within its territory. Couches hidden in extensive reed beds, or in dense scrub. Holts can be found underground among rocks or caves but can be excavated in peat banks. In general, otters exploit a narrow strip of habitat along a river or stream.

The otter is an opportunistic feeder with a varied diet. Fish are the most important food, but crayfish can be important locally.
Signs of otter activity including spraints and bank slides were searched for at the sites surveyed. Areas where couches or holts were likely were examined.

[1] Otter are listed in Appendix II of the Bern Convention (1982) And protected under the EU Habitats Directive

3. SURVEY

The sites 1-12, surveyed over three days, 16-18 September 2022, are shown in Figure 1.1.
The species recorded were:

- 3-spined stickleback (*Gasterosteus aculeatus*)
- Trout (*Salmo trutta*)
- Pike (*Esox Lucius*)
- Stone loach (*Barbatula barbatula*)
- Roach (*Rutilus rutilus*)
- Tench (*Tinca tinca*)
- Gudgeon (*Gobio gobio*)
- Brook/River Lamprey amnocoete (*Lampetra* sp.)[2]
- White clawed crayfish (*Austropotamobius pallipes*)[3]

Lengths are given in centimetres (cm). Fork lengths are recorded for trout and full lengths for other species. The carapace length is given for crayfish.

The survey complied with the Certificate of Authorisation provided by the Department of Communications, Climate Action & Environment, see Appendix C. The Department of Housing, Local Government and Heritage was informed of the survey.

[2] protected under both Irish law (Wildlife Act 1976) and the EU Habitats Directive Annexes II and V. It is classified as endangered in the (IUCN) Red List. It is listed in Appendix III of the Bern Convention

[3] Brook and river Lamprey are listed in Annex II of the Habitats Directive and in Appendix III of the Bern Convention

3.1 Site 1, Ledwithstown Stream

Site Description: This Site is in the upper reaches of the Ledwithstown. It is a deep canalised (trapezoidal shaped) lowland depositing stream, 1.5m wide with 4-5m high banks. Photo 3.1.1. The stream had 0.2-0.3m deep peat-stained water. The flow profile was dominated by slow moving glide with very localised riffle, Photo 3.1.2.

The bed comprised of gravels with heavy peat sedimentation. The channel was heavily overgrown with macrophytes including branched bur reed (*Sparganium erectum*), reedmace (*Typha latifolia*) and water mint (*Mentha aquatica*). The riparian areas were comprised of dense gorse, hedge bindweed, great willowherb and grey willow bordering cutover lowland blanket bog.

Fisheries Value: It was only possible to carryout spot electro-fishing at this site and no fish were recorded. The channel was not of value to fish or crayfish due to heavy sedimentation, limited flows, and dense vegetation growth.

Macroinvertebrates: Kick sampling analysis assessed this site as having a Q rating of 3, Appendix A. The absence of clean water along with EPA indicator groups A and B and the dominance of Group C and D pollution indicators resulted in the Q3 poor status biological water quality rating recorded.

Otter: No evidence of otters was recorded.

Photo 3.1.1 showing overgrown nature of Site 1

Photo 3.1.2 Downstream view of Site 1

3.2 Site 2, Lough Bannow Stream

Site Description: This was a trapezoidal heavily modified lowland river channel that was artificially deepened and straightened as part of historical drainage, Photo 3.2.1.

The channel was 2.5-3m wide with bank heights of 2.5-3m and 0.5-1m deep with a bed of gravel and soft silt. The steep banks supported bramble, great willowherb, wild angelica, rank grasses and willow scrub. The channel was bordered by mature sitka spruce plantation and dry grassy meadows. The channel had heavy cover of fool's watercress, water plantain with (*Potamogeton lucens*) and (*Callitriche stagnalis*) locally. The duckweed species (*Lemna trisulca*) and (*Lemna minor*) were abundant in the channel indicating enrichment, Photo 3.2.2.

Fisheries Value: A timed electro-fishing was undertaken but only a single pike 29.5cm was detected. There was no fisheries value for salmonids but was considered of value for coarse fish, as it was deep and slow flowing.

Given the time of year, autumn these species are likely localised in the channel.

Macroinvertebrates. The absence of clear water, and the dominance of group C and D pollution indicators resulted in the Q3 poor status biological water quality rating recorded at Site 2, Appendix A

Otter: Poor bank and river quality for otter and no visible signs found.

Photo 3.2.1 Showing U shaped banks.

3.3 Site 3, Ballynakill River

Site Description: This was a highly modified lowland depositing watercourse that has been deepened and straightened historically (evident dredge berms and elevated banks). The site was dominated by glide habitat with very localised riffle upstream of the culvert at the road crossing, Photo 3.3.1.

Bank height was 2-4m and river width of 3-4m with depth of between 0.2m to 0.5m. The channel had very localised branched bur-reed, yellow water lily and common duckweed species, often found in channelised peatland rivers. The riparian zone comprised of hawthorn, blackthorn and grey willow with bramble, bracken, bindweed, and bittersweet scrub. Downstream of the culvert reed sweet grass was common in riparian areas.

Fisheries Value: Considered of some value to coarse fish and salmonids given there was areas of glides and gravel substrate with moderate flow. A timed survey was carried out but no fish were recorded. Spawning and nursery value is diminished given historical drainage maintenance and absence of shallower riffle zones. The channel was not considered of value to crayfish given historical drainage and a substrata with heavy siltation. This also diminished the spawning and nursery value for brown trout and none recorded in the current survey. Downstream of the culvert crossing the water was stagnant with very deep peat-stained water and was only of value for coarse fish, Photo 3.3.2

Macroinvertebrates: Site 3 had EPA group A and B clean water indicator taxa present, Appendix A. However, the sample composition was dominated by group C moderate water quality indicator species with smaller numbers of group D taxa. This accounted for the moderate (Q3-4) biological water quality status recorded.

Otters: There were no signs of otter at this site.

Photo 3.3.1 The overgrown nature of site

Photo 3.3.2 Canal like aspect of Site 3

3.4 Site 4, Ballynakill River

Site Description: This is a lowland depositing watercourse exhibiting deepened and straightened with a U- shaped channel profile, Photo 3.4.1. The channel was 2-3m wide with bank height of 4-5m and water depths between 0.2m and 0.4m. The bed comprised of gravel but was heavily silted. The flow profile was dominated by glide habitat with very localised riffle.

The channel supported frequent branched bur-reed, common water starwort and small patches of (*Potamogeton berchtoldii*). The riparian zone comprised of grey willow, blackthorn, hedge bindweed, great willowherb, and bramble. The bordering land was predominantly grassland. The channel downstream of culvert improves as it changes to a V shape flowing through mixed broadleaved woodland. Here the channel was predominantly glide with cobble and gravel improving the salmonid nursery and spawning value.

Fisheries Value: There was moderate nursery area upstream of the culvert at the road crossing, improving to good nursery and spawning downstream given a better river profile with more riffle with associated cobble and gravels. The site was of no value for lamprey, despite some soft sediment because of the compacted bed, and none were recorded.

One crayfish was taken during electro-fishing 2.5cm but small numbers were observed escaping in the sediment.

Two three spined sticklebacks, (4.6, 4.1cm) were recorded.

Trout were present in low numbers (13) but both 0+ and older were recorded, Table 3.4.1. The channel was considered a moderate quality trout nursery and spawning area, but its potential is reduced due to historical drainage and heavy siltation.

The site is also moderately suitable for crayfish and sticklebacks.

Macroinvertebrates: Despite the relative open nature of the stream and the presence of fish the Q value was 3 suggesting poor status, Appendix A. The absence of clean water EPA group A and B indicators and the dominance of Group C and D pollution indicators resulted in the Q3 poor status biological water quality rating recorded.

Otter: Remains of crayfish were evident in regular otter spraints in the culvert. Here both latrine sites in mud and spraint sites on concrete ledges were observed.

Table 3.4.1		
No.	Species	Length
1	Brown Trout	16.2
2	Brown Trout	22.3
3	Brown Trout	14.0
4	Brown Trout	7.5
5	Brown Trout	7.0
6	Brown Trout	6.6
7	Brown Trout	8.4
8	Brown Trout	7.3
9	Brown Trout	7.4
10	Brown Trout	8.7
11	Brown Trout	6.9
12	Brown Trout	4.6
13	Brown Trout	4.1

Photo 3.4.1 Showing relatively open water.

3.5 Site 5, Fallan River

Site Description: The channel was representative of a lowland depositing watercourse that was deepened and straightened historically but retained a semi-natural profile with glide and riffle sequences, Photo 3.5.1. The bank heights were 1.5m and the river width was 2.5m with an average depth of 0.4m. Instream there was abundant fool's watercress, branched bur reed macrophyte beds with frequent common duckweed. The riparian zone comprised of great willowherb, bramble and wild angelica with rank grasses. The bed comprised of mixed coarse gravels with pockets of soft silt in the margins, albeit these were predominantly superficial shallow bands. The channel was bordered by grassland. A kingfisher was observed over the site.

Fishery Value. The channel had good spawning and nursery value and good holding habitat for salmonids with glide and riffle sequences but also loose coarse and medium gravels. A timed 10-minute survey yielded the trout numbers (65) in Table 3.5.1, in Appendix B. From the size range profile shown in Table 3.5.2, this is a natural population structure with likely 3 age groups represented. Size range 4.5-8.9, (0+), 10.0-15.9, (1+) and one trout greater than 1+. A single lamprey was recovered. There was light to moderate siltation with most siltation near the box culvert, Photo 3.5.2. There was moderate value lamprey habitat given the low numbers recorded despite good ammocoete habitat (burial areas in silt and nearby fine gravels for spawning). The channel was suitable for crayfish albeit none were recorded.

Macroinvertebrates. The site had clean water indicator group B species present. However, the sample was dominated by EPA group C taxa, Appendix A. The absence of group A clean water indicator species and the dominance of group C, moderate water quality indicator species, accounted for the Q3 poor status, biological water quality recorded at the site.

Otter. The channel offered good foraging value for otter given the river was a good salmonid nursery, but no otter signs were recorded.

Photo 3.5.1. Showing open channel at Site 5

Photo 3.5.2 Showing the culvert area where there are silt deposits suitable for lamprey

3.6 Site 6, Lough Bannow Stream

Site Description: This was a deep canalised lowland depositing river channel, that was trapezoidal shaped following deepening and straightening, as shown in Photo 3.6.1. The channel was 3m wide with 0.5-0.8 depth. The flow profile was of deeper very slow-moving glide. The bank heights were 3m and dominated by bramble, bracken, hedge bindweed and willow scrub. The macrophytes included abundant branched bur reed (Sparganium erectum), common water starwort (Callitriche stagnalis), water plantain (Alisma plantago aquatica) and (Potamogeton berchtoldii). The channel had a gravel and peat base. A foraging kingfisher was observed in flight over the channel.

An area some 200m downstream was also surveyed. This was a deep canalised lowland depositing section that was 3-4m wide and deepened and straightened historically. The channel was very deep both upstream and downstream of the culvert at the road crossing with 5-10m on either side being shallower.

Approximately 10m upstream of the culvert a steep shelf exists in the peat where the channel dropped off to circa 2m. The channel was 1.5m deep c. 5m downstream of the box culvert. The main fishable area was in the vicinity of the box culvert where 0.1m to 0.4m deep water was present. The bank heights were 3m. The flow profile was of deep glide with a small area of riffle adjoining the culvert. The bed included soft peat with gravels in the footprint of the culvert. Macrophytes were localised near the culvert and included water mint, fool's watercress and watercress. The steep riverbanks have dense bramble, bracken and grey willow scrub. Land use was lowland blanket bog.

Fisheries Value: The site was difficult to electro-fish, given the instream vegetation and the overgrown banks, however spot fishing was possible for small areas, but no fish were recorded. Two three-spined stickleback which were taken with the macroinvertebrate kick sample. The first section fished was of little value to salmonids but may hold coarse fish at times of high water. The area downstream had some clear water and spot electro-fishing was also possible. This section had value as a holding area for coarse fish. A single tench was recorded. No crayfish remains were detected in the single otter spraint recorded at the culvert.

Macroinvertebrates: Macroinvertebrate samples were taken at both parts of this site. The Q value at the upstream section was 2-3, Appendix A, (Site 6) suggesting a bad status. This is confirmed by the lack of fish despite having relatively good substrate although with heavy peat loads. The site was dominated by EPA group C moderate water quality indicator species but also had significant numbers of pollution indicator group D taxa, that supported the Q2-3 poor status biological water quality recorded at the site.

The downstream section although with slightly clearer water had a Q value of 3 with corresponding poor status, Table 1, (Site 6A). Clean water indicator group B species were present. However, the sample was dominated by group C moderate water quality indicator taxa and also supported group D pollution tolerant species. The absence of group A clean water indicator species and dominance of group C moderate water quality indicator species accounted for the Q3 poor status.

Otter. The channel has some foraging value for otter as a single spraint was observed at the downstream area of the site.

Photo 3.6.1 Showing the overgrown nature of Site 6.

3.7 Site 7, Lough Bannow Stream

Site Description: This was a deep canalised U-shaped lowland depositing river 3-4m wide and was deepened and straightened historically, Photo 3.7.1 The water depth was between 0.5-1.0m but deepening downstream of a culvert at the road crossing to 1.5m. The bank heights were 3-4m and the channel flow profile was dominated by deeper glide. The bed comprised of mixed gravels and soft silt. The riparian areas comprised of dense scrub, bramble, gorse, nettle, hedge bindweed with mature grey willow, osier and ash trees. The land use was agricultural grassland.

Macrophyte were abundant in the channel and included water horsetail (*Equisetum fluviatilis*), water lily (*Nuphar lutea*), water mint (*Mentha aquatica*) and common reed (*Phragmites australis*).

Fishery Value: The channel was not of value to salmonids given slow flows, extensive instream vegetation and heavy siltation but likely supports coarse fish seasonally. There was some value in the channel as a crayfish nursery given the presence of gravels and sufficient depth, but heavy siltation and enrichment reduced suitability and no fish were recorded during the electro-fishing survey. One stone loach measuring 4cm was recorded while kick-sampling. No crayfish were recorded at the site.

Macroinvertebrates: This site had a Q3 rating poor quality, Appendix A. The absence of clean water EPA group A and B indicator groups and the dominance of Group C with Group D pollution indicators resulted in the Q3 poor status biological water quality rating recorded at the site.

Otter. The channel had some foraging value and as a commuting route for otter albeit no signs were recorded.

Photo 3.7.1 Enclosed nature of site 7

3.8 Site 8, Lough Bannow Stream Tributary

Site Description: This is a small tributary of the Lough Bannow Stream. It is a U-shaped channel 4-5m wide and 0.5-1.3m deep, and was deepened and straightened historically. It had with abundant macrophytes, broad-leaved pondweed, fool's watercress and occasional water mint in deeper peat- stained water. The substrate is compacted peat. The bank height was 3m with riparian areas supporting mature grey willow, alder, ash, poplar and bramble scrub. Land use was predominantly lowland blanket bog and grassland.

Fishery Value. The channel was of no fisheries value due to stagnant water and only considered of value perhaps to three-spined stickleback. No fish were recorded either during spot electro-fishing or in subsequent kick sampling. The channel was not suitable for crayfish or lamprey given stagnant water and none were recorded.

Macroinvertebrates. Site 8 was situated in a stagnant peat drain and was not suitable for biological water quality sampling. The sample supported species common in watercourses of this nature, i.e., Gerridae, Asellidae and Corixidae.

Otter: The channel had some foraging value and as a commuting.

3.9 Site 9, Un-named Stream

Site Description: The channel was a very heavily modified lowland depositing watercourse. The channel was 1.5m wide, very deep U-shaped in character with vertical 3m high peat banks Photo 3.9.1. The water depth varied between 0.5m and 1.5m with a deep peat base and stagnant water. The channel supported only dense growths of common reed (*Phragmites australis*). The riparian zone comprised of dense bramble, bracken, nettle, and grey willow scrub. The bordering land was cutover peatland, Photo 3.9.2.

Fishery Value: The site was unsuitable for electro-fishing as it comprised a series of small pools with minimum flow through the dense reed growth. The channel had low value for fish and crayfish, and none were recorded during kick sampling. Based on the nature of this stream, its substrate and low flows it has low spawning and nursery value for fish, but the habitat may improve downstream as it approaches the River Shannon.

Macroinvertebrates: The site was dominated by group C moderate water quality indicator species, Appendix A, but also pollution indicator, group D taxa that suggested the Q3 poor status biological water quality recorded.

Otter: There was low foraging value for otter and no signs were recorded during the survey.

Photo 3.9.1 Overgrown nature of site

Photo 3.9.2 Landscape surrounding site

3.10 Site 10, Ballynakill River

Site Description: The channel was a heavily modified lowland depositing watercourse in a U-shaped channel. The bank height was 1-2m and the depth was between 0.3m and 0.5m. Despite historical deepening the channel had semi-natural characteristics with glide sequences with some riffle areas. The bed comprised mainly of coarse gravel and fibrous peat material. It had boulder, cobble and gravel bedded with heavy siltation. The channel supported no macrophytes apart from fool's watercress. The riparian zone comprising bramble and dense willow scrub. The bordering land uses were of mixed broadleaved plantation ash woodland.

Fisheries Value: The site had low spawning and nursery value but moderate holding habitat for salmonids and coarse fish given its deep U shape profile (channelised) with moderate flow but no broken flow pattern. The channel was a moderate quality brown trout nursery given the presence of broken glide habitat and a hard bottom. The substrate was of moderate value at best and heavy sedimentation reduced the spawning value as reflected by the absence of 0+ brown trout, Table 3.10.1. The spawning and nursery value was therefore diminished due to the small amount of shallower oxygenated riffle zones. Three fish species were recorded during the timed electro-fishing survey at this site, a total of 11 brown trout, two gudgeon and one roach, Table 3.10.1. The channel had moderately suitable for crayfish, but none were recorded. There were some small pockets of gravel and silt suitable for lamprey, but none were recorded.

Macroinvertebrates: The site had a small number of clean water indicator taxa but was dominated by group C moderate water quality invertebrates, Appendix A. The community composition supported the Q3 poor status biological water quality assessment.

Otter: There was good foraging value for otter, but no signs were recorded during the survey

Table 3.10.1

No.	Species	Length (cm)
1	Brown Trout	18.0
2	Brown Trout	19.5
3	Brown Trout	14.3
4	Brown Trout	18.4
5	Brown Trout	18.0
6	Brown Trout	15.6
7	Brown Trout	17.7
8	Brown Trout	14.2
9	Brown Trout	15.3
10	Brown Trout	15.0
11	Brown Trout	13.2
12	Gudgeon	11.0
13	Gudgeon	8.0
14	Roach	4.2

3.11 Site 11, Ballynakill River

Site Description: This is a deep canalised and trapezoidal shaped lowland depositing river. The channel was deep, 1.2-1.5m with a peat base and peat-stained water. The channel supported occasional spiked water milfloil, floating sweet grass and water plantain. The very steep 8m high banks were densely vegetated with grey willow, birch, ash, bramble, hogweed and great willow herb. The bordering land was grassland.

Fisheries Value There was limited, or no salmonid value given the depth, peat-substrate and the lack of flow but the site may have some holding value for coarse fish at times. It was not suitable for crayfish or lamprey.

Macroinvertebrates: Site 11 was dominated by group C moderate water quality indicator species but also had small numbers of pollution indicator group D taxa present, Appendix A. The community composition recorded supported the Q3 poor status biological water quality recorded.

Otter. The channel may have some value as a foraging and commuting habitat for otter albeit no signs were recorded.

Photo 3.11.1 Deep canal like section at Site 11.

3.12 Site 12, Ledwithstown Stream

Site Description. The survey area was characterised by a historical straightened and deepened, providing a U- shaped stream channel that was 1m wide with 2.5m bank heights. The stream was 0.05m deep with slow flowing water over a bed of gravel, peat and silt. The channel was heavily overgrown with common reed (*Phragmites australis*). The channel was heavily shaded with mature birch, grey willow, gorse and bracken, Photo 3.12.2. The bordering land use was of cutover blanket bog.

Fisheries Value: The stream was not of value to fish or crayfish given the very shallow depth and low flows leading to stagnant water.

Macroinvertebrates: Clean water indicator group B species were present. However, the sample was dominated by EPA group C taxa (i.e., moderate water quality indicators) with smaller numbers of pollution indicator Group D taxa, Appendix A. The absence of group A clean water indicator species and the dominance of EPA group C moderate water quality indicator species accounted for the Q3 poor status, biological water quality recorded at the site.

Otters. No evidence of otters but activity unlikely due to lack of fish

Photo 3.12.1 Showing overgrown banks at Site 12

4. SUMMARY BY RIVER

There were 5 streams surveyed all flowing into Lough Ree. The Fallon river joins the Camlin river before entering the Shannon near Clondara. The Ballynakill River enters the Shannon just north of Cloonkeel. The Loughbannow River enter the Shannon just North of Lanesborough before its entry to Lough Ree. The stream marked unnamed drains the bog area north of Lanesborough. The Ledwithstown Stream River flows south before entering Lough Ree near Drumnee.

Weather conditions and water flows were ideal for electro-fishing, and it is expected that the results reflect an accurate picture of the status of these rivers at the time of the survey, where electrofishing was possible. The rivers have all had major drainage works carried out to varying extents. This has reduced the fisheries value of these streams by imposing U or V shaped channels and generally steep high banks. The substrates have been degraded by deposition of peat silt. The natural sinuosity has in general been removed and many stretches are canal like with slow deep flows. The reduction of riffle areas has seriously reduced the habitat for salmonids but the canal like stretches may provide holding areas for coarse fish species at specific times or conditions.

The biological quality of the rivers showed uniform values over all the sites sampled Appendix A. All had low values at Q3 except for Site 3 on the Ballynakill River which had Q3-4. These values were in keeping with the silt deposits in the substrate and the general condition of the streams.

4.1 Fallan River, Site 5

Site 5, Table 4.1, below is in the upper reaches of the Fallen River a tributary of the Camlin River. This is a good salmonid stream. It has a mix of riffle and glide areas. It flows through agricultural land and is likely to have salmonids throughout its length. It has a normal brown trout population structure, being composed of 3 age groups. One lamprey (ammoecete) was recovered in silt at the road conduit. There are small quantities of suitable lamprey habitat in that area.

The river at this point has poor biological quality. it was assessed as having a Q value of 3. It is expected that this will improve further downstream as silt loads decrease.

Despite suitable habitat particularly at the road conduit and a good population of fish no signs of otter were observed in the area sampled.

4.2 Unnamed stream, Site 9

Site 9, Table 4.1 is a U-shaped stream with high banks, draining extensive previously worked bog. The substrate is peat and flows are restricted due to the dense growth of common reed, so that the water is stagnant. It has little fishery value at this point but may improve further downstream as it approaches the Shannon. The biological river quality was assessed as poor. There were no otter signs around this site.

4.3 Ballynakill River, Sites 3, 4, 10, 11

The Ballynakill stream Table 4.1, has areas suitable for salmonids throughout its length. The densities are low, but brown trout were observed at Sites 4 and 10. The brown trout population

structure at Site 10 is not ideal given there were no 0+ trout present. Site 3 had relatively good salmonid habitat including glide and some riffle areas, but no fish were recovered during electro-fishing. Site 11 was deep and slow flowing and not suitable for salmonids. These deeper more canalised areas are suitable as holding-areas for coarse fish.

The water quality throughout is poor as determined by its Q values. Site 3 was rated as Q3-4

Although otter traces were observed on only one site, many of the other sites had some possibilities as foraging and commuting habitats, and it is possible that otter range throughout this tributary.

4.4 Lough Bannow Stream Sites 2, 6, 7, 8

The Lough Bannow Stream, Table 4.1, is mainly confined to coarse fish and may be used as holding areas throughout its length at different times of the year, river flows and depths. One pike was recovered at site 2. In the upstream part of site 6 no fish were taken by electro-fishing but two 3 spined stickleback were found in the kick samples. There was extensive in river vegetative growth which made electro-fishing extremely difficult. A single tench was recovered in the more open area downstream. No fish were recovered from spot fishing at sites 7 and 8.

The biological river quality was poor throughout.

Some of the sites were of foraging and commuting value for otter although signs were found only at one site. Otters use at least parts of this stream.

4.5 Ledwithstown Stream, Sites 1, 12

These sites Table 4.1, are at the upper reaches of the Ledwithstown Stream. They have no fishery value at this point. The sites were heavily overgrown and there was substantial peat sedimentation. The streams are shallow with low flows. The water quality is poor. No evidence of otters was found during the survey, but this is very much the upper reaches of the system

Table 4.1 Electro-fishing sites- Physical attributes

Site	River	Longitude	Latitude	Width	Depth	Bank Height	Fishing Method	Observation
1	Ledwithstown	53.59989	-7.87311	1.5m	0.2-0.3m	4-5m	Spot	no fish
2	Lough Bannow	53.64565	-7.93975	2.5-3m	0.05-1m	2.5-3m	Timed	1 pike
3	Ballynakill	53.69795	-7.93235	3-4m	0.2-0.5m	2-4m	Timed	no fish
4	Ballynakill	53.67458	-7.89824	2-3m	.2 -0.4m	4-5m	Timed	13 Trout
5	Fallon_02	53.65891	-7.84905	2.5m	0.4-0.6m	1.5m	Timed	65 trout
6	Lough Bannow	53.63212	-7.91662	3m	0.5m	3m	Spot	1 Stickleback
6Ext	Lough Bannow	53.63419	-7.91393	3-4m	0.4-2M	3m	Spot	1 Tench
7	Lough Bannow	53.64748	-7.94073	3-4m	0.5-1.0	3-4m	Spot	1 Stone loach
8	Lough Bannow	53.66912	-7.92959	4-5m	0.5m	3m	Spot	no Fish
9	Lough Bannow	53.69257	-7.96504	1.5m	0.5-1.5m	3m	-	Macroinvertebrates only
10	Ballynakill 010	53.70195	-7.94199	5m	0.3-0.5	1-2m	Timed	11 Trout, Gudgeon, Roach
11	Ballynakill 011	53.64307	-7.87296	4m	1.2-1.5	8m	-	-
12	Ledwithstown	53.61855	-7.84791	1m	0.05m	2.5m	Spot	no Fish

5. REFERENCES

Matson, R., Delanty, K., Shephard, S., Coghlan, B., and Kelly, F. (2017) Moving from multiple pass depletion to single pass timed Electro-fishing for fish community assessment in wadeable streams. Fisheries Research, 198, 99-108

Toner, P., Bowman, K., Clabby, K., Lucey, J., McGarrigle, M, Concannon, C., Clenaghan, C., Cunningham, P., Delaney, J., O'Boyle, S., MaCarthaigh, M., Craig, M., and Quinn, R. 2005. Water Quality in Ireland 2001-2003. Environmental Protection Agency, Wexford

Appendix A MACROINVERTEBRATE SAMPLES FROM SITES 1-12

Site 1

Family	Abundance	EPA Group
Baetidae (Baetis rhodani)	11	C
Polycentropodidae	8	C
Hydrobiidae	6	C
Gammaridae	26	C
Planorbiidae	1	C
Gyrinidae	5	C
Dytiscidae	2	C
Elmidae	5	C
Tipulidae	1	C
Asellidae	7	D
Lymnaeidae	5	D
Site 1		
Q Rating	3	
Water Quality Status	Poor	

Site 2

Family	Abundance	EPA Group
Ephermeridae	3	A
Polycentropodidae	6	C
Hydrobiidae	18	C
Sphaeriidae	21	D
Gammaridae	26	C
Planorbiidae	6	C
Calopterygidae	2	B
Asellidae	13	D
Glossiphoniidae	1	D
Site 2		
Q Rating	3 (Tentative)	
Water Quality Status	Poor	

Site 3

Family	No.	EPA Group
Chloroperlidae	2	A
Sericostomatidae	8	B
Gammaridae	11	C
Elmidae	1	C
Sphaeriidae	11	D
Hydrobiidae	6	C
Simuliidae	5	C
Chironomidae (ex Chironomus sp.)	5	C
Ancylidae	14	C
Asellidae	4	D
Site 3		
Q Rating	Q3-4	
Water Quality Status	Moderate	

Site 4

Family	No.	EPA Group
Baetidae (Baetis rhodani)	9	C
Corixidae	6	C
Gammaridae	11	C
Dytiscidae	8	C
Gyrinidae	2	C
Elmidae	3	C
Sphaeriidae	19	D
Hydrobiidae	21	C
Simuliidae	16	C
Ceratopogonidae	1	C
Chironomidae (excl. Chironomus sp.)	2	C
Asellidae	9	D
Tubificidae	1	E
Site 4		
Q Rating	Q3	
Water Quality Status	Poor	

Site 5

Family	Abundance	EPA Group
Baetidae (other)	2	B
Ephemerellidae	5	C
Limnephilidae	1	B
Lepidostomatidae	3	B
Baetidae (Baetis rhodani)	31	C
Gammaridae	29	C
Hydropsychidae	11	C
Elmidae	6	C
Dytiscidae	4	C
Hydrobiidae	31	C
Chironomidae	6	C
Simuliidae	5	C
Asellidae		D
Site 5		
Q Rating	3	
Water Quality Status	Poor	

Site 6

Family	Abundance	EPA Group
Gammaridae	11	C
Notonectidae	6	C
Asellidae	32	D
Chironomidae (Chironomus sp.)	8	E
Glossiphonidae	6	D
Lymnaeidae	1	D
Site 6		
Q Rating	2-3	
Water Quality Status	Bad	tentative Q

Site 6 (Downstream)

Family	Abundance	EPA Group
Sericostomatidae	1	B
Baetidae (Baetis rhodani)	3	C
Gammarus	28	C
Elmidae	1	C
Asellidae	14	D
Lymnaeidae	2	D
Site 6A		
Q Rating	3	
Water Quality Status	Poor	

Site 7

Family	Abundance	EPA Group
Elmidae	14	C
Hydropsychidae	6	C
Polycentropodidae	5	C
Gammaridae	11	C
Ancylidae	4	C
Hydrobiidae	9	C
Sphaeriidae	12	C
Chironomidae (non-chir)	2	C
Asellidae	21	D
Glossiphonidae	3	D
Site 7		
Q Rating	**3**	
Water Quality Status	Poor	

Site 8. Not suitable for assessment. Families Gerridae, Asellidae and Corixidae present.

Site 9

Family	Abundance	EPA Group
Corixidae	11	C
Notonectidae	4	C
Chironomus sp.	3	E
Asellus aquaticus	19	D
Site 9		
Q Rating	**3**	
Water Quality Status	Poor (Tentative Q)	

Site 10

Family	Abundance	EPA Group
Ephemerellidae	3	C
Baetidae (Baetis rhodani)	16	C
Limnephilidae	2	B
Lepidostomatidae	2	B
Polcentropodidae	6	C
Gammaridae	5	C
Sphaeriidae	3	D
Site 10		
Q Rating	**3**	
Water Quality Status	Poor	

Site 11

Family	Abundance	EPA Group
Coenagrioniidae	1	B
Gammaridae	5	C
Corixidae	16	C
Dytisicidae	2	C
Planorbiidae	3	C
Valvatidae	2	C
Sphaeriidae	8	D
Lymnaeidae	2	D
Site 11		
Q Rating	**Q3 (n/a)**	tentative Q
Water Quality Status	**n/a**	

Site 12

Family	Abundance	EPA Group
Baetidae (Baetis rhiodani)	11	C
Leptoceridae	6	B
Limnephilidae	2	B
Gammaridae	26	C
Hydraenidae	2	C
Elmidae	4	C
Dytiscidae	2	C
Chironomidae (non-chironomus sp.)	2	C
Tipulidae	3	C
Asellidae	14	D
Glossiphonidae	3	D
Site 12		
Q Rating	**Q3**	
Water Quality Status	**Poor**	

Appendix B FISH TAKEN BY ELECTRO-FISHING AT SITE 5

Fish taken by electro-fishing at Site 5

Table 3.5.1 Fish taken by electro-fishing at Site 5

No	Species	Length Cm		No	Species	Length cm		No	Species	Length cm
1	Brown Trout	18.8		23	Brown Trout	12.4		45	Brown Trout	7.5
2	Brown Trout	14.2		24	Brown Trout	7.0		46	Brown Trout	7.7
3	Brown Trout	15.1		25	Brown Trout	7.0		47	Brown Trout	6.7
4	Brown Trout	13.5		26	Brown Trout	8.3		48	Brown Trout	7.0
5	Brown Trout	13.9		27	Brown Trout	11.4		49	Brown Trout	7.3
6	Brown Trout	12.4		28	Brown Trout	7.4		50	Brown Trout	7.4
7	Brown Trout	12.2		29	Brown Trout	6.7		51	Brown Trout	7.1
8	Brown Trout	6.4		30	Brown Trout	6.4		52	Brown Trout	7.0
9	Brown Trout	12.5		31	Brown Trout	6.5		53	Brown Trout	8.1
10	Brown Trout	13.2		32	Brown Trout	7.0		54	Brown Trout	7.8
11	Brown Trout	8.0		33	Brown Trout	7.2		55	Brown Trout	7.7
12	Brown Trout	14.4		34	Brown Trout	10.1		56	Brown Trout	7.1
13	Brown Trout	13.4		35	Brown Trout	8.9		57	Brown Trout	6.9
14	Brown Trout	13.2		36	Brown Trout	8.5		58	Brown Trout	6.1
15	Brown Trout	11.6		37	Brown Trout	6.4		59	Brown Trout	6.2
16	Brown Trout	8.0		38	Brown Trout	7.7		60	Brown Trout	6.9
17	Brown Trout	11.3		39	Brown Trout	7.9		61	Brown Trout	7.1
18	Brown Trout	12.0		40	Brown Trout	6.8		62	Brown Trout	6.2
19	Brown Trout	14.2		41	Brown Trout	7.2		63	Brown Trout	5.6
20	Brown Trout	11.3		42	Brown Trout	8.4		64	Brown Trout	4.9
21	Brown Trout	12.5		43	Brown Trout	7.1		65	Brown Trout	6.2
22	Brown Trout	11.8		44	Brown Trout	8.6		66	Lamprey	10.1

Appendix C CERTIFICATE OF AUTHORISATION

An Roinn Comhshaoil,
Aeráide agus Cumarsáide
Department of the Environment,
Climate and Communications

CERTIFICATE OF AUTHORISATION UNDER SECTION 14 OF THE FISHERIES (CONSOLIDATION) ACT, 1959 AS SUBSTITUTED BY SECTION 4 OF THE FISHERIES (AMENDMENT) ACT, 1962

The Minister for the Environment, Climate and Communications in exercise of the powers conferred on him by Section 14 of the Fisheries (Consolidation) Act, 1959 as substituted by Section 4 of the Fisheries (Amendment) Act, 1962 hereby authorises: John Browne, Stillwaters Consultancy, 24 Thorncliffe Park, Churchtown, Dublin. D14DD80, and or person(s) nominated by him to carry out an electrofishing survey within selected sections of the Shannon catchment. The purpose of the requested licence is to assess fish populations in the vicinity of a proposed Wind Farm site near Lanesborough in Longford.

This authorisation is granted subject to the following conditions:

1. This authorisation shall not confer on the holder thereof, independently of the conditions therein,

   (a) any rights or title which the holder would not have had if this Authorisation had not been given, or

   (b) any authority in any way to interfere with or infringe the lawful rights of any other person.

2. This authorisation is issued to and valid for use by Mr. John Browne and or person(s) nominated by him.

3. This authorisation is valid until 30th September 2022.

4. The Director of the Shannon River Basin District and the appropriate Fisheries Inspector (as indicated by the Director) should be informed at least five days prior to the intended start date of the work providing the exact date(s), location and scope of the planned electro-fishing work. Contact details are as follows:

   IFI Limerick,
   Ashbourne Business Park,
   Dock Road,
   Co. Limerick.
   V94 NPE0

   Email: limerick@fisheriesireland.ie;
   Phone: 061 300238

5. As Lough Ree is a Special Area of Conservation (SAC), IFI request that National Parks and Wildlife Service (NPWS) are made aware of the proposed operation prior to commencement.

6. Acknowledging the applicant has indicated that there is no intention to kill any fish, the number of inadvertent fish mortalities resulting from the electro-fishing is to be kept to an absolute minimum and IFI inspectors are to be informed of any fish mortalities that occur immediately after the work concludes.

7. IFI request that all lamprey captured in the survey be identified to species level if feasible and measured (total length in mm is standard). This information should also be included on the IFI reporting template.

8. If invasive species are encountered, the field operatives should record their presence, indicate their abundance and extent of occurrence, along with a geo-reference in their report material submitted to IFI.

9. The names of the personnel undertaking the electro-fishing operations are required for the Section 14 authorisation.

10. Electro-fishing should, if possible, be carried out between July 1st and September 30th when juvenile salmon (if present) are of a sufficiently large size to be caught by electro-fishing, to minimize damage and for them to be distinguished from similar species (refer to CEN (2001) and CFB (2008) 'Electric Fishing in Wadeable Reaches' manual).

11. The applicant and agents should desist, to the greatest extent possible, from walking in the general instream area and to avoid walking on instream gravelled areas if present, thereby limiting adverse impact to intra-gravel life stages of salmonids and other species.

12. IFI insists upon strict adherence to the Biosecurity Protocol for Field Survey Work, whereby equipment must be disinfected prior to and after use to prevent the spread of disease, parasites or invasive species (http://www.fisheriesireland.ie/Biosecurity/biosecurity-protocol-for-field-survey-work.html) (and as directed by an officer of IFI). The applicant should be mindful of the potential occurrence of invasive alien species, either in the watercourse being surveyed or in the adjoining riparian zone. Extra care should be taken to ensure that plant fragments and seeds of invasive balsam and knotweed species are not

inadvertently transported on clothing, footwear or equipment. It would be very helpful if the applicant could record presence of such species, along with geo-reference and indication of extent of occurrence, in report material submitted to IFI. If possible, surveying should commence at the uppermost site and proceed sequentially downstream to reduce the risk of carrying invasive species upstream.

13. In the event that the proposed electrofishing operation is cancelled IFI should be notified and an indication of the proposed re-commencement date of the electrofishing operation should also be advised.

14. **No electric fishing should be undertaken at this site when water temperatures exceed 20°C due to the risk to fish. Where water temperatures approach this threshold and fish are obviously stressed electric fishing should cease.**

15. The fishing gear when not in use shall be kept in a secure place known to an officer of the Shannon River Basin District of IFI and the local Garda Siochána. All equipment must be available for inspection by an IFI officer during the survey.

16. IFI recommends that the applicant seeks permission from fishery owners and informs local angling clubs of their plans for the surveys where relevant. The applicant must also seek permission from landowners to cross land, where relevant.

17. No fish of any species should be sacrificed during the surveys. The number of fish killed (if any) is to be kept to an absolute minimum and IFI Ballina and Citywest are to be informed of any fish mortalities immediately after the survey.

18. The surveyor should be mindful of other species, e.g. white-clawed crayfish, which might be encountered during the electro-fishing exercise.

19. IFI request that any larval lamprey captured in the survey (refer to Maitland, P.S. (2003) *Ecology of the river, brook and sea lamprey.* Conserving Natura 2000 Rivers. Ecology Series No. 5, English Nature, Peterborough) be measured (total length in mm is standard). This information should also be included on the IFI reporting template.

20. The operators should be cognisant of the increased risk of mortalities occurring during warmer periods of weather or prolonged containment of fish and such fish should be regularly monitored for signs of stress and released in a timely manner to mitigate for any mortality risk. **Expected species groups, e.g., salmonids, eel and lamprey, should be noted, with references to standard sampling and welfare approaches.**

21. A standard template for reporting survey data to IFI is attached. IFI request that a survey report and qualitative/quantitative data (in the attached standard IFI format) be provided, within 30 days of completion of the survey, in electronic format to Sandra Doyle (Sandra.Doyle@fisheriesireland.ie). The report must include mortality data and a full account of qualitative/quantitative results. This data will not be made publically available, for a period of three years, without the permission of the applicant.

22. Failure to comply with any of the conditions of this Authorisation may result in revocation of this Authorisation.

23. The holder of this Authorisation shall indemnify and keep indemnified the State, the Minister for the Environment, Climate and Communications and the Minister for Finance against any claims, arising in any manner whatsoever in connection with the user of the fishing gear or in the exercise of the permission hereby granted.

24. Notwithstanding the foregoing, this Authorisation may be revoked or amended by the Minister for the Environment, Climate and Communications without the payment of compensation to the holder on giving one week's notice in writing to the holder if he considers it necessary in the public interest to do so.

Dated the 29 August 2022

For the Minister of the Environment, Climate and Communications

Una Ward

An officer authorised on that behalf by the said Minister

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