SECTION D – EXISTING ENVIRONMENT & IMPACT OF THE DISCHARGE(S)

Attachment D2: Appropriate Assessment

- **Table D.2.1: Natura Impact Statement for Millstreet WWTP Upgrade**



Millstreet WWTP Upgrade

Natura Impact Statement

November 2016

Irish Water

Mott MacDonald

Millstreet WWTP Upgrade

Natura Impact Statement

November 2016

Irish Water

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B	24th August 2015	R. Mansfield	C. O'Dwyer P. Kelly	P. Kelly	Revised following Client input
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D	08 November 2016	R. Mansfield	F. McGivern	F. McGivern	Revised following Client input

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Executive Summary

Introduction

The wastewater treatment plant (WWTP) in Millstreet was constructed in the early 1970s, approximately 0.7 km north of the town centre adjacent to the Tanyard Stream. The design capacity of the WWTP is 1,600 population equivalents (pe). The primary discharge is to the Tanyard Stream. The existing wastewater loading to the treatment plant (excluding that from the Green Glens Arena) has been calculated as 2,032 3pe. The wastewater comprises mainly of domestic effluent. It is calculated that an additional loading of up to 833pe is received at the treatment plant during large events at the Green Glens Arena (typically hosted 4 times per year).

A Wastewater Discharge Authorisation Licence was issued for the Millstreet agglomeration by the EPA in February 2014 (Reg. No. D0332-01). The authorisation prescribes Specified Improvement Works which were to be completed by 31 December 2015. These improvement works require the installation of a wastewater treatment plant with nutrient reduction and the discontinuance of the primary discharge to the Tanyard Stream.

As part of the statutory planning process, proposals to upgrade the Millstreet WWTP are subject to Appropriate Assessment by the Competent Authority (in this case Cork County Council) in accordance with the requirements of Articles 6(3) and 6(4) of Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive). The proposed receiving water for the discharge treated effluent from the upgraded WWTP is the Finnow River, which forms part of the Blackwater River Special Area of Conservation (SAC) (site code: 002170). An initial screening for Appropriate Assessment was conducted in June 2015 and determined **Potential Significant effects** of the construction and operation of the Millstreet WWTP upgrade works on the Blackwater River SAC (site code: 002170).

Negative impacts associated with the upgrade works which have the potential to be significant were identified in the screening assessment as:

- destruction of aquatic and riparian habitat through excavation of land / river substrate to accommodate the WWTP and outfall
- pollution / sedimentation of the watercourse caused by works during construction of the outfall pipe
- pollution of the watercourse during operation associated with accidental spill of chemicals
- release of inadequately treated effluent to the watercourse due to management of peak loadings to the WWTP.

This Natura Impact Statement further considers these impacts relative to the conservation objectives of the Blackwater River SAC.

Impact Prediction

An assessment of the potential impacts on the qualifying interests of the Blackwater River SAC was conducted using the source-pathway-receptor approach which was supported by ecological field assessment carried out in 2014 and 2015. The mechanism (source) of impact in all cases is sedimentation / pollution of the watercourse during construction. Negative operation stage impacts were determined unlikely due to plant design requirements.

Significance of Impacts

Potential impacts on the conservation objectives of the River Blackwater SAC were assessed in terms of the potential to negatively impact on the structure, function, and integrity of the conservation objectives of Freshwater Pearl Mussel, Sea lamprey, Brook lamprey, River lamprey, Atlantic Salmon and Otter.

- The Department of Communications, Climate Action and Environment is in the process of amending the conservation objectives for the Blackwater River SAC so that the requirement to maintain or restore the population of the freshwater pearl mussel will no longer be a requirement for the main channel of the river. The conservation objectives for the pearl mussel in the Lickey and Allow tributaries will be retained. There will be no objective to maintain or restore pearl mussel in the Finnow River.
- It was determined that the conservation targets to restore the favourable conservation condition of Otter in the Blackwater River SAC will not be negatively affected by the proposed upgrade works
- The conservation target for Atlantic salmon requiring no decline in the number and distribution of spawning redds could be impacted by the proposed WWTP upgrade. The objective to maintain the favourable conservation condition of Atlantic Salmon in the Blackwater River SAC will be impacted.
- Similarly, for all lamprey species of conservation interest in the SAC, the requirement for no decline in extent and distribution of spawning beds could be impacted by the construction works. The objective to restore the favourable conservation condition of Sea Lamprey and maintain the favourable conservation condition of Brook Lamprey and River Lamprey in the Blackwater River SAC could be impacted.

Mitigation

Measures which have been prescribed to mitigate against the potential impacts on the conservation objectives of the Munster Blackwater SAC include sediment control and control of pollutants associated with construction material and machinery.

1 Introduction

1.1 Background

The wastewater treatment plant (WWTP) in Millstreet was constructed in the early 1970's approximately 0.7 km north of the town centre and adjacent to the Tanyard Stream. The design capacity of the WWTP is 1,600 population equivalents (pe). The treatment plant comprises an extended aeration system followed by settlement. Preliminary screening is provided. Additional preliminary treatment in the form of grit removal or stormwater separation is not provided. Two storm overflow chambers within the WWTP site allow excess flows to bypass the treatment process and flow directly into the Tanyard stream. The primary discharge is also to the Tanyard stream. Settled sludge is dewatered on site via a mobile dewatering unit and tankered off site for further treatment and recovery / disposal.

The existing wastewater loading to the treatment plant (excluding that from the Green Glens Arena) has been calculated as 2,032pe. The wastewater comprises mainly of domestic effluent. It is calculated that an additional loading of up to 833pe is received at the treatment plant during large events at the Green Glens Arena (typically hosted 4 times per year).

The collection system in Millstreet is a partially combined sewerage system comprising two distinct networks, one of which serves the western half of the town while the second serves the eastern part of the town. Hydraulic loading to the plant exceeds design capacity. As a result the storm overflows at the treatment plant are operating even during minor storm events. It is likely that there is an associated local degradation in water quality during storm events.

Mott MacDonald Ireland Ltd. was commissioned by Cork County Council to prepare a Preliminary Report (issued in 2011) in respect of upgrading the Millstreet wastewater treatment facilities. The Preliminary Report (and associated assessments) recommended a new scheme to cater for the existing and future needs of the town with scope for expansion to meet further long-term population growth. The Preliminary Report recommended procurement using a Design Build contract with an Operating contract for 20 years. Sewer rehabilitation works were recommended for inclusion in the DBO Contract to address infiltration.

A Wastewater Discharge Authorisation Licence was issued for the Millstreet agglomeration by the EPA in February 2014 (Reg. No. D0332-01). The authorisation prescribes Specified Improvement Works which were to be completed by 31 December 2015. These improvement works reflect the findings of the Preliminary Report and require the installation of a wastewater treatment plant with nutrient removal and the discontinuance of the primary discharge to the Tanyard stream. Emission limit values are prescribed in the waste water discharge licence (as set out in Table 1.1 hereunder) to ensure that the receiving waters will meet the high status requirements of the European Communities Environmental Objectives (Surface Water) Regulations 2009 (as amended). Additionally having regard to the designation of the receiving waters as salmonid under the European Communities (Quality of Salmonid Waters) Regulations 1988, an emission limit value was set for suspended solids.

Table 1.1: Treated Effluent Discharge Standards

Parameter	Units	Emission Limit Value
pH	pH units	6-9
cBOD	mg/l	25
COD	mg/l	125
Ammonia as N	mg/l	1.0
Orthophosphate as P	mg/l	0.5
Suspended solids	mg/l	25

Mott MacDonald Ireland Ltd. was appointed by Cork County Council in December 2013 to prepare Contract Documents for these upgrade works to the Millstreet WWTP. With the establishment of Irish Water by the Water Services Act 2013 and the transfer of Contracts from the Water Services Authorities to Irish Water through the Water Services (No. 2) Act 2013 (Transfer of Other Liabilities) Order 2014 (S.I. No. 96/2014), this contract was novated to Irish Water. The proposed upgrade to the Millstreet WWTP must therefore be progressed under the standard (Section 34) planning process (as opposed to the Part 8 Planning Process) whereby Irish Water must seek approval from Cork County Council as the relevant Planning Authority.

As part of the statutory planning process, proposals to upgrade the Millstreet WWTP are subject to Appropriate Assessment[1] by the Competent Authority (in this case Cork County Council) in accordance with the requirements of Articles 6(3) and 6(4) of Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (Habitats Directive). A screening for Appropriate Assessment was conducted by Mott MacDonald Ireland Ltd. in July 2015 for the upgrade works to the Millstreet WWTP which concluded that there is potential for impact on the Blackwater River SAC (002170).

1.2 Summary of Appropriate Assessment Screening Outcome

DEHLG Guidance[2] states that screening for Appropriate Assessment should be carried out for any Natura 2000 site within the likely Zone of Influence of a plan or project. For projects, the guidance recommends that the Zone of Influence must be evaluated on a case-by-case basis regarding the nature, size and location of the project, and the sensitivities of the ecological receptors, and the potential for in combination effects. Projects have the potential to impact on European sites beyond the confines of the individual sites themselves.

As an initial screening exercise, Natura 2000 sites within 15km of the proposed Millstreet WWTP upgrade were identified using GIS (geographic information system) mapping data sourced from www.npws.ie. Natura 2000 sites within a 15km radius are:

- Blackwater River (Cork/Waterford) SAC

[1] The proposed receiving water for the discharge of treated effluent from the upgraded WWTP is the Finnow River, which forms part of the Blackwater River Special Area of Conservation (SAC) (site code: 002170).

[2] DEHLG (2009) Appropriate Assessment of Plans and Projects in Ireland Guidance for Planning Authorities

- Killarney National Park, Macgillycuddy's Reeks and Caragh River Catchment SAC
- Mullaghanish Bog SAC
- Mullaghanish to Furthermore Mountains SPA

The Zone of Influence of a project is the area in which qualifying interests are present which are sensitive to the ecological impacts that may be caused by the activities associated with the project. The zone of influence will therefore vary relative to the scale of the impact and relative to the ecology of the sensitive receptor. To establish the zone of influence for the proposed upgrade to the Millstreet WWTP, nationally available data on protected habitats and species was mapped using GIS. This data was interrogated for any physical, hydrological, or ecological connectivity to the activities associated with the proposed upgrade works.

It was determined that of the Natura 2000 sites within a 15km radius of the Millstreet WWTP, significant effects on the qualifying interests of the **Blackwater River SAC (002170)** are likely as a result on habitat destruction and pollution / sedimentation of the watercourse associated with the proposed upgrade works.

1.2.1 Stakeholder Consultation

DAU and NPWS

The Development Applications Unit (DAU) of the Department of Arts, Heritage & the Gaeltacht was contacted on 12th August 2014 regarding the proposals to upgrade the Millstreet WWTP and a pre-planning consultation meeting was requested with the DAU and National Parks and Wildlife Services to discuss the design proposals with respect to environmental considerations. At the time of these consultations the proposals included for the routing of the outfall pipeline parallel to the eastern bank of the Tanyard Stream and discharging downstream of the streams confluence with the Finnow River.

Irish Water, Cork County Council, and Mott MacDonald met with Jervis Good (Regional Ecologist) and Patrick Foley and Declan O'Donnell (Conservation Rangers) from NPWS with responsibility for the Munster Blackwater catchment on 27th August 2014.

- The NPWS stated that the assessment of the capacity of the River Finnow to assimilate the discharge from the Millstreet WWTP should be based on flows which consider drought conditions.
- NPWS stated that the Appropriate Assessment should consider construction and operation impacts and should assess potential impacts on Freshwater Pearl Mussel at the different life stages (to include potential impacts from sedimentation and potential for limiting fish movement during construction). Potential for effects of endocrine disruption to trout was also to be included, as this is the primary host species in Ireland utilised by the Freshwater Pearl Mussel Glochidia stage.

A draft screening report was issued to NPWS / DAU in December 2014. Observations in relation to same were received on 26th February 2015 (G Pre00324/2014 – included in Appendix A) which included a recommendation for further freshwater pearl mussel survey work. A meeting was held with NPWS on 11th

March 2015 to address the observations and determine the appropriate scope of freshwater pearl mussel survey work. A presence / absence survey for freshwater pearl mussel was carried out on 12th September 2014 which confirmed the presence of mussels in the main channel of the River Blackwater at the confluence with the River Finnow. A detailed habitat condition assessment was carried out with regard to the Environmental Objectives (Freshwater Pearl Mussel) Regulations (S.I. 296 of 2009) in June 2015. This assessment was coupled with a Stage 2 visual survey for freshwater pearl mussel. No freshwater pearl mussels were found in the River Finnow. A further survey of the River Finnow was commissioned in February 2016 in support of proposals to alter the route of the proposed outfall along Station Road and discharging into the Finnow River at Finnow Bridge. The survey area comprised a section of the river approximately 50m upstream of Finnow Bridge and ending adjacent to the confluence with the Tanyard Stream. Neither live freshwater pearl mussel nor dead shells were recorded throughout the survey.

Communication was received from NPWS on 4th February 2016 advising that the decision was taken to amend the conservation objectives for freshwater pearl mussel in the Blackwater River SAC on the basis that initial listing of freshwater pearl mussel as a qualifying interest was poorly founded due to inadequate information. NPWS advised that the following course of action will be taken in this regard:

- Amend the conservation objectives for the Blackwater River SAC in order that there would no longer be the objective of maintaining or restoring freshwater pearl mussel populations in the main channel of the river;
- Retain the conservation objectives for the freshwater pearl mussel in the Lickey and Allow tributaries of the Blackwater, which are included in the SAC;
- Notify the Commission of the change;
- Amend the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations (S.I. 296 of 2009) to give further effect to the alteration of the conservation objectives for the River Blackwater SAC.

Inland Fisheries Ireland

Andrew Gillespie (IFI Fisheries Environmental Officer) was contacted on 11th November 2014 regarding potential environmental constraints to the proposed upgrade to the Millstreet WWTP in relation to salmonids and lamprey. A formal response was submitted by Mr Gillespie, on behalf of Inland Fisheries Ireland, on 03rd December 2014. A copy of the response is provided in Appendix A and includes the following principal points:

- IFI should be contacted prior to active site works commencing to meet site contractors regarding good environmental practice measures for site activities;
- A setback distance of 10m from the Tanyard Stream is a suitable distance for outfall construction considering the landscape;
- Construction of the outfall pipe in the Finnow shall be constructed outside of the fish spawning season, October to June inclusive (i.e. construction must only be carried out during July to September inclusive). IFI should be contacted a minimum of one week prior to these works

proceeding to arrange for inspection and de-stocking of the works area to take place as may be necessary;

- Bank protection will be required for construction of the outfall discharge pipe to the Finnow River.

1.3 Overview of the Proposed Millstreet WWTP Upgrade

1.3.1 Design

The existing wastewater loading at the treatment plant is estimated to receive a population equivalent (pe) of 2,032pe. To allow for future population growth, development in the town and the fluctuation in plant loading experienced during events in Green Glens Arena, the design treatment capacity of the plant is to increase to 3,220pe. The treated effluent discharge standards to be achieved by the plant, as prescribed in the EPA waste water discharge licence D0332-0, are set out in

Table 1.1 above.

1.3.2 Procurement

A decision has been taken by Irish Water that the proposed upgrade works to the Millstreet WWTP are to be procured and constructed under a Design Build Contract and as such flexibility will be allowed in the design and construction of the works to accommodate innovative proposals from the Contractor subject to the approval of Irish Water. This procurement approach is consistent with Department of Finance policy.

The Tender Documents for the Design Build Contract will identify the performance requirements that must be achieved by the wastewater treatment plant. These performance requirements will be based on the treated effluent standards as prescribed in the EPA waste water discharge licence D0332-01, and must be achieved over the full range of loads to the WWTP over the design life of the plant. Other performance requirements will also be set out in the Tender Documents including odour and noise limits, as well as construction stage requirements including environmental mitigation measures that must be implemented.

Each Tender will be required to prepare a Preliminary Design at Tender Stage, and this Preliminary Design will be evaluated as part of the Tender Evaluation process. Each Tender will need to demonstrate clearly their proposed design and how this design will meet the performance requirements set out in the Tender Documents (both during the construction stage and the operation stage). The Tenderer will be required to provide appropriate evidence that the treatment plant design can achieve the performance requirements set out in the Tender Documents. This evidence will be provided by reference to similar treatment plants that have been constructed in similar environments and climatic conditions to those at Millstreet.

The Tenderers will also be required to demonstrate the resilience of the plant to fluctuations in plant loading. This is particularly relevant in Millstreet where events at the Green Glens Arena can result in a significant influx of people to the town, with an associated increase in the loading at the treatment plant.

This information will all be evaluated in the assessment of the various Tenders received.

1.3.3 Construction/Operation

During the construction stage of the project, a team of Resident Engineers will be on the site to oversee the effective delivery of the construction and commissioning phases of the project, to ensure that the commitments made by the Contractor during the Tender process are delivered in full. The contract will include a wide array of construction and operational phase performance standards and oblige the appointed Contractor to consult with NPWS, IFI and other identified stakeholders to ensure that relevant construction methodologies for the project are agreed (including any mitigation measures which have only been outlined in general up to that stage of the project) and implemented in a coordinated manner. Payments are only made to the Contractor when agreed ‘milestones’ in the project delivery process have been reached and have been demonstrated to be achieved in full.

During the operational phase of the project, effective treatment of wastewater, compliance with discharge standards specified in the Environmental Protection Agency's Discharge Authorisation are all monitored, reviewed and reported to Irish Water. These reports will also form the basis of the Annual Environmental Report (AER) that must be submitted by Irish Water to the EPA. The AER will record how the treatment plant has performed, and the reports are made available to the general public.

At all stages during the construction and operation the Contract will include Key Performance Indicators (KPI's) which will provide a measure of how the Contractor is performing. The Contract will include for financial penalties where the required KPI's are not achieved. Repeated failure to achieve these KPI's can result in termination of the contract.

1.3.4 Specimen Design

The upgraded plant must be capable of performing and achieving the treated effluent standards as prescribed in the EPA waste water discharge licence D0332-01 over the full range of loads to the WWTP over the design life of the plant. The Contract Documents will reflect the requirements of the EPA discharge licence and will set out the levels of waste water treatment required to achieve these standards.

The proposed upgrade will be primarily constructed in the currently vacant northern area of the existing fenceline without interfering with the operation of the existing treatment system, which must be maintained in operation throughout the upgrading works. The footprint of the upgraded treatment system within the site will be subject to the Contractor's design. A specimen design layout is shown on Drawing Nr. MMD-330760-C-DR-00-XX-0113, Appendix B. This layout is based on an activated sludge treatment process.

The proposed process is in accordance with the EPA Waste Water Treatment Manual on Primary, Secondary and Tertiary Treatment, which prescribes the general principles and practices which should be followed by those involved in the treatment of urban waste water. It should be noted that BAT guidance (best available techniques)[3] has not been devised to date specifically for municipal waste water treatment.

Storm Water

The collection system in Millstreet is a combined system (storm water and foul water), with storm water contributing significant flows to the WWTP. At the entrance to the WWTP site there is an overflow chamber from which there are two overflow pipes that discharge directly into the Tanyard stream adjacent to the site entrance. It is proposed that the overflows from this chamber are blocked off and sealed, and that a new 525 mm diameter pipe is installed to connect to the proposed preliminary treatment works at the WWTP.

A new storm water overflow chamber will be constructed and fitted with a 6mm solids retention type of screen. This will be designed such that flows in excess of 60.6 l/s (representing 6 DWF) will overflow via the storm water screen into the Tanyard stream. This outfall will be fitted with a non-return valve (such as a duckbill type) to prevent water flowing back into the plant from the stream during high flows in the stream.

[3] As defined in Section 5 of Environmental Protection Agency Acts, 1992 to 2007

Flows at the inlet works in excess of 27.03 l/s will overflow to a storm water tank. Construction of a new storm water tank is proposed with an approximate capacity of 280 m³. Any overflow from this tank will discharge to the Tanyard stream. The maximum water level and overflow level in this tank would be sufficient to allow gravity overflow to the stream under normal stream flow conditions. When water level in the stream is too high to facilitate gravity discharge of the storm water, the water level in the storm tank will rise and the pumps will be activated to pump the storm water into the overflow pipeline to the Tanyard Stream. The contents of the storm tank will be pumped back to the secondary treatment process when incoming flows are less than 3DWF[4].

Preliminary Treatment

The preliminary treatment works, comprising screening, grit removal and forward feed pumping systems are to be located to the north of the site i.e. the furthest point within the site from the nearest residential properties.

Secondary Treatment

The wastewater will be subjected to secondary treatment using an activated sludge treatment process, in a configuration that includes for the reduction of nitrogen. The activated sludge process is a well proven process in the treatment of domestic type wastewater and is capable of achieving the required emission limit values for BOD, COD, suspended solids and nitrogen. Similar type treatment plants are in operation in Bandon and Bantry, Co. Cork. The reduction in phosphorus will be achieved by the addition of ferric sulphate which causes the precipitation of phosphorus. This is also a well proven and widely used method to achieve the required reduction in phosphorus.

Treated Wastewater Outfall

The discharge from the existing wastewater treatment plant is to the Tanyard Stream. It is intended to discontinue this discharge and divert the treated wastewater via a new outfall pipeline to the River Finnow. The initial proposal was to route the outfall pipeline along the eastern bank of the Tanyard Stream. However, because of issues associated with the use of the lands and potential difficulties with obtaining wayleaves, the route was changed to run along Station Road, with the discharge at the bridge on Station Road to the Finnow River at this location. Ecofact Environmental Consultants carried out a survey of the proposed new outfall location. A copy of the Ecofact report is included in Appendix C.

Sludge Management

Liquid sludge from small WWTPs in the townlands neighbouring Millstreet is currently transported to the Millstreet WWTP for dewatering along with the sludge generated at the WWTP. Mobile dewatering is undertaken approximately every four weeks at Millstreet WWTP. Subcontractors are employed by IW for

[4] DWF (Dry Weather Flow) is the average daily sewage flow entering the WWTP measured following 7 days without rain and during which on the preceding 7 days, rainfall did not exceed 25 mm on any day

the collection, transportation, treatment and recovery/disposal of sludge from its WWTPs. During 2015 dewatered sludge from Millstreet WWTP was taken either to the Eras Eco facility in Youghal, Co. Cork for lime stabilisation or to Portlaw, Co. Waterford for composting. Currently It is expected that this practice will continue but will be subject to review in the future following the completion of Irish Water's National Sludge Policy.

Supernatant sludge liquors decanted from the thickening tank will be subjected to secondary treatment. Thickened sludge will be pumped from the bottom of this sludge thickening tank into a separate sludge storage tank. This storage tank should have at least 28 days storage capacity for the thickened sludge to allow for possible unavailability of the de-sludging tanker.

General surface water drainage around the site will be discharged via the local storm water outfall. However, surface water drainage from the hardstanding area near the sludge tanks, i.e. where the sludge tankers will be connected for sludge removal, will be connected to a pipeline gravitating to the forward feed sump upstream of the secondary treatment stage.

Similarly the surface water drain near the screenings and grit treatment unit and the drains from within the control building will also be diverted to the same sump.

2 Receiving Environment

2.1 Blackwater River SAC (002170)

The River Blackwater is one of the largest rivers in Ireland, draining a major part of County Cork and parts of Counties Kerry, Limerick, Tipperary and Waterford. The site consists of most of the freshwater stretches of the system as well as the estuarine component at Youghal.

The site supports important examples of a range of Annex I habitats, including floating river vegetation and alluvial forests. *Trichomanes speciosum* occurs near Lismore. Most of the woodlands have a significant amount of non-native species, including conifers and the invasive *Rhododendron ponticum*.

The Blackwater system is an important salmonid fishery and is of high conservation value for *Salmo salar*. The Blackwater also supports important populations of *Lampetra planeri, L. fluviatilis,* and *Petromyzon marinus*. Substantial populations of *Margaritifera margaritifera* occur within the Blackwater River. White-clawed crayfish (*Austropotamobius pallipes*) is found in the Awbeg River. *Lutra lutra* is also widespread throughout the site.

Species protected under Annex I Birds Directive which are present within the site include breeding *Egretta garzetta, Alcedo atthis* and *Falco peregrinus* and wintering *cygnus cygnus* and *Pluvialis apricaria*. A good diversity of other winter waterfowl species also occurs.

The principle threats to the Blackwater River SAC are pollution. Sources in the catchment include agricultural run-off (fertilisers, slurry etc.) and point sources (mainly in towns along the rivers), and in some areas possibly forestry activities. Pollution is a threat to various fish populations as well as *Margaritifera margaritifera* and *Austropotomobius pallipes*.

2.2 Existing Baseline Condition

ECOFACT Environmental Services Ltd. was commissioned by Mott MacDonald in September 2014 to undertake an aquatic and terrestrial ecological survey of the Millstreet WWTP (comprising the existing WWTP site, the access road, and the lands to the north of the site on which the upgraded treatment plant is to be constructed). The original proposed route of the outfall pipe (parallel to the Tanyard Stream and discharging to the Finnow River) was also surveyed, however it is of note that this option has now been superseded by the new proposal to route the pipe along Station Road and to discharge into the Finnow River at Finnow Bridge. The purpose of the survey was to evaluate the habitat in the vicinity of the proposed WwTP upgrade in order to determine the presence / likely presence of qualifying interests of the SAC and to assess the condition of such qualifying interests where they are present.

Following consultation with NPWS on 11th March 2015, ECOFACT Environmental Services Ltd. was commissioned by Mott MacDonald to undertake a further survey for Freshwater Pearl Mussel (*Margaritifera margaritifera*) at Millstreet. The purpose of the survey was to assess in greater detail the local Freshwater Pearl Mussel (FPM) habitat condition and population in the River Finnow and Blackwater River.

Subsequent to the above surveys, it was determined that the preferred route for the outfall pipe was to be along Station Road, discharging to the River Finnow at Finnow Bridge. ECOFACT Environmental Services Ltd was therefore commissioned in February 2016 to carry out an additional Otter survey, Freshwater Pearl Mussel survey, and a bat survey of the outfall route and discharge location. Mott MacDonald Ireland also conducted a habitat and invasive species survey of the outfall route on 05th October 2016.

Copies of all reports are included in Appendix C.

2.2.1 Summary of the Findings of the Ecological Surveys

2.2.1.1 Terrestrial Survey

Habitat Survey

The ecological value of habitats within the survey area was evaluated in accordance with the National Roads Authority publication 'Guidelines for Assessment of Ecological Impacts of National Roads Schemes' (2009).

- Managed areas of grass within the existing Millstreet WwTP grounds correspond to 'amenity grassland'. These habitats are evaluated as local importance (lower value).
- Planted treelines consisting of beech (*Fagus sylvatica)*, ash *(Fraxinus excelsior)*, oak (*Quercus* sp.), sycamore (*Acer pseudoplatanus)* and Scot's pine (*Pinus sylvestris)* occur along field boundaries within the study area. These are intensively managed as evidenced by the lack of understorey vegetation and the presence of bare ground beneath the treelines. Treelines along the Tanyard Stream and River Finnow are more diverse and have an understorey of hawthorn (*Crataegus monogyna)* and are considered to be semi-natural. The treelines within the site are evaluated as being of local importance (higher value) with respect to wildlife connectivity and the cover they provide for mammals and birds.
- The mixed broadleaf woodlands along Station Road are dominated by beech and also include ash, hawthorn, sessile oak (*Quercus petraea*), holly (*Ilex aquifolium*) and alder (*Alnus glutinosa*). The woodland habitat is classified as local importance (higher value) with respect to the ecological corridors they provide for mammal species.
- The Tanyard Stream and the River Finnow are classified as eroding upland watercourses. These watercourses have stony substrates and are heavily shaded in places. The Tanyard Stream upstream of the Blackwater River cSAC is of local importance, higher value. Within the Blackwater River cSAC, Finnow River and Tanyard stream are evaluated as being internationally important.
- No protected flora or Annex I habitat was recorded from within the study area.

Mammal Survey

The proposed site for the WwTP upgrade works does not suit the burrowing requirements of many mammal species such as badger *Meles meles.* There was no evidence of badger activity (foraging) or badger setts within the site of the proposed WwTP upgrade works. There are a number of mammal paths

and rabbit burrows within the beech woodlands which parallel Station Road (the route of the proposed outfall). No evidence of badger was observed during field survey.

Footprints deemed to be those of a mink (*Mustela vison)* were recorded along the Tanyard Stream. This species is non-native and it predates on and threatens other native wildlife.

Otter prints and spraints were identified at the Finnow Bridge and along the river bank. No otter holts or couches were observed.

The study area is generally poor with regard to feeding and dwellings for non-volant mammals, owing to intensive management. Overall, the study area is rated as being of local importance (lower value), with the exception of the watercourse which rated as being of local importance (higher value) due to its use by otter.

A bat activity survey was undertaken during early October 2014 and three species of bat were recorded; Common Pipistrelle, Soprano pipistrelle, and Daubenton's bat. A high level of pipistrelle activity (both species) was recorded in the area of the access road to the existing waste water treatment plant. This was found to the most important area for bat activity in the study area. A bat survey was carried out at Finnow Bridge in March 2016 which included a daytime roost assessment and night time bat detector survey. No evidence of bats was recorded during the survey. It should be noted that March and April is a 'flux' period for bats whereby they are travelling between winter and maternity roosts. The bridge was assessed as having crevices ideal for bats but no evidence of usage. Trees in the vicinity of the Finnow bridge provided a suitable foraging / commuting corridor habitat for bats. In the event that works are to be carried out in proximity to the bridge between March and October inclusive, a bat emergence survey will be required to establish if bats are using the bridge for roosting.

2.2.1.2 Aquatic Survey

The Tanyard Stream and the Finnow River (between Finnow Bridge and Wallis's Bridge) were not assigned a Water Framework Directive status classification in the 2007-2009 and 2010-2012 as these watercourses were not monitored. The EPA did however carry out macroinvertebrate sampling on the River Finnow between 2004 and 2015 (macroinvertebrates are used as indicators of water quality). The monitoring site at Inchileigh Bridge (18F030200), upstream of the Millstreet WWTP shows Good water quality (Q4). The monitoring site at Wallis's Bridge (18F030400), downstream of the Millstreet WWTP also shows Good water quality (Q4), indicating that the discharge from the WWTP is not currently causing a deterioration in water quality.

The lower reaches of the Tanyard Stream and the Finnow River were assessed for habitat suitability for aquatic macroinvertebrates and fish during the 2014 ecological surveys. The habitat of the Tanyard Stream within the study area was rated as being marginal-suboptimal for macroinvertebrates and was assessed as limited with respect to fish production due to its small size. The Finnow River has optimal bottom substrate and habitat complexity but overall was rated suboptimal for macroinvertebrate production due to suboptimal canopy cover and bank features. The Finnow River is a very important spawning and nursery

area for both trout and salmon. A significant population of brook lamprey also occurs. There is a good population of host fish in both the Blackwater and Finnow Rivers with regard to FPM glochidia (larvae). The salmonid population in both the Blackwater and Finnow Rivers was considered healthy given the abundance of juveniles.

The Finnow River flows in to the River Blackwater, which has been classified as having Good Status under the Water Framework Directive status classification 2010-2012.

Freshwater Pearl Mussel (FPM) was not recorded in the Tanyard Stream - this watercourse is deemed unsuitable for FPM considering its small size and depth. FPM was not recorded in the surveyed stretches of the River Finnow. Adult FPM were recorded in the River Blackwater upstream and downstream of the River Finnow confluence.

2.2.2 Qualifying Features of the SAC

The Blackwater River SAC is a Special Area of Conservation (SAC) selected for the following habitats and species listed on Annex I and Annex II of the E.U. Habitats Directive:

Table 2.1 Blackwater River SAC Qualifying Interests

Qualifying Interest (* indicates priory habitat)	
Annex I Habitats	**Annex II Species**
• Estuaries [1130] • Mudflats and sandflats not covered by seawater at low tide [1140] • Perennial vegetation of stony banks [1220] • Salicornia and other annuals colonising mud and sand [1310] • Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330] • Mediterranean salt meadows (Juncetalia maritimi) [1410] • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [3260] • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles [91A0] • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae) [91E0]	• *Margaritifera margaritifera* (Freshwater Pearl Mussel) [1029] • *Austropotamobius pallipes* (White-clawed Crayfish) [1092] • *Petromyzon marinus* (Sea Lamprey) [1095] • *Lampetra planeri* (Brook Lamprey) [1096] • *Lampetra fluviatilis* (River Lamprey) [1099] • *Alosa fallax fallax* (Twaite Shad) [1103] • *Salmo salar* (Salmon) [1106] • *Lutra lutra* (Otter) [1355] • *Trichomanes speciosum* (Killarney Fern) [1421]

Ecological field assessment has identified the presence of the following qualifying interests of the Blackwater River SAC in the vicinity of the Millstreet WwTP:

- Lamprey
- Atlantic Salmon
- Otter and
- Freshwater Pearl Mussel

The remaining qualifying features of the Blackwater River SAC are absent from the vicinity of the works and/or have no physical or hydrological connection to the proposed works areas (refer to Table 2.2).

Table 2.2: Qualifying Features of the Blackwater SAC Screened out from Further Assessment

Qualifying Interest	Rational for exclusion from further assessment
White-clawed crayfish	Within the Blackwater River system, white-clawed crayfish is present only on the Awbeg River.
Twaite shad	Twaite Shad spend their adult life at sea or in the lower reaches of estuaries and normally spawn near the tidal limits and as such do not occur within the zone of influence of the Millstreet WWTP upgrade works.
Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	This Annex I habitat does not occur within the vicinity of the Millstreet WWTP upgrade works.
Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	A stand of water crowfoot Ranunculus sp. was recorded by Ecofact in 2014 in the River Finnow approximately 100m downstream of the Tanyard stream confluence. This does not correspond to the Annex I habitat 'Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation'.
Old sessile oak woods with Ilex and Blechnum in British Isles	This Annex I habitat does not occur within the vicinity of the Millstreet WWTP upgrade works.
Taxus baccata woods of the British Isles	This Annex I habitat does not occur within the vicinity of the Millstreet WWTP upgrade works.
Killarney fern	Killarney Fern occurs within the Blackwater River SAC near Lismore, in County Waterford and as such does not occur within the zone of influence of the Millstreet WWTP upgrade works.
Estuaries	These habitats are associated with a coastal environment and as such does not occur within the vicinity of the Millstreet WWTP upgrade works..
Mudflats and sandflats not covered by seawater at low tide	
Perennial vegetation of stony banks	
Salicornia and other annuals colonizing mud and sand	
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	
Mediterranean salt meadows (Juncetalia maritimi)	

3 Impact Prediction

3.1 General

The proposed upgrade to the Millstreet WWTP will be primarily constructed in the currently vacant northern area of the existing site (~2800m^2). This land parcel is outside the boundary of the Blackwater River SAC.

The new outfall pipeline, proposed to discharge to the Finnow River, will be routed along Station Road and will discharge to the watercourse at Finnow Bridge. The River Finnow is within the Blackwater River SAC.

The likely direct and indirect; short term and long-term effects of the construction and operation of the upgrade to the Millstreet WwTP on Lamprey, Atlantic Salmon, Otter and Freshwater Pearl Mussel within the River Blackwater SAC is presented in Table 3.1 and Table 3.2.

Impact assessment is determined using source-pathway-receptor assessment. The vulnerability / sensitivity of the qualifying interests to an impact is assessed using best available scientific data. There are a number of factors that determine the sensitivity of a species to a pressure, for example, the extent / scale of disturbance in space and time, the numbers of species affected relative to local population condition, the availability of similar habitats in the vicinity, whether a pressure is irreversible or reversible and the length of time required for a species to recover.

3.1.1 Construction Stage Impacts

Table 3.1: Construction Stage Impacts

Source (Impact)	Pathway	Receptor (Qualifying Interest)	Predicted Impact (in the absence of mitigation)
Destruction of Habitat	**Excavation of River Substrate for Outfall Construction** River habitat at the location of the in-stream works at Finnow Bridge comprises largely of cobbles with patches dominated by finer sediments (gravels and sands). Levels of silt were considerable throughout the survey stretch. There will be some loss of fishery habitat within the footprint of the outfall (likely to be a 300mm diameter pipe). The outfall pipe will be required to extend in to a riffle area in the watercourse to accommodate optimum mixing of effluent (IFI requirement), i.e. roughly half way across the river. The wetted width of the River Finnow at this location is approximately 5m. The trench required to accommodate a 300mm pipe is typically approximately 1m in width. Therefore the likely area to be excavated will be 2.5m^2. **Removal of Riparian Habitat at the Outfall Location on the Finnow River** The construction of the outfall pipe to the River Finnow will require tree felling. The outfall will be routed through a small section of the Beech woodland on the upstream bank of the bridge. The tree cover is sparse at the proposed outfall location. It is likely that very limited vegetation clearance will be necessary. The felling of beech trees will not be necessary; however some willow scrub will be cleared along the river bank at the outfall location. Ground flora, dominated by bramble, will also be cleared. **Spread of Invasive Species** A large stand of Japanese Knotweed (*Fallopia japonica*) occurs at the Finnow Bridge (immediately upstream) on the norther bank of the watercourse. This stand is approximately 3m X 15m in area. There are a number of smaller stands further upstream on the same bank and an in the field adjacent to the northern bank upstream of the bridge.	**Lamprey & Salmonids** There is potential for destruction of salmonid and adult lamprey habitat due to excavation of river substrate to accommodate the outfall. No suitable habitat for juvenile lampreys was recorded in the Finnow River. It is therefore considered that there is no risk of impact on juvenile lamprey habitat and similarly there is no risk of excavation of live juvenile lamprey in the river substrate. In-stream works for the purpose of outfall construction can cause disturbance to the stands of Japanese Knotweed which are present on the opposite bank of the Finnow River. This species spreads vegetatively in Ireland. New plants can grow from fragments of parent plant material (stems and rhizomes). Disturbance of river bank or of the plant itself is highly likely to act as a vector for its propagation along the river. This in turn will degrade riparian habitat necessary to support salmonid species. **Freshwater Pearl Mussel*** The River Finnow has been assessed as suboptimal habitat for Freshwater Pearl Mussel. There is no risk of destruction of Pearl Mussel habitat at this location. **Otter** No holts or couches were recorded along the River Finnow. There is no evidence of usage of the willow scrub on the river bank by otter. There is therefore no potential for destruction of otter resting places during construction.	• **Direct, permanent impact on salmonid and lamprey spawning habitat.** • **Indirect damage to riparian habitat by disturbing Japanese Knotweed during construction**
Disturbance to Species	**Outfall Construction in the Finnow River** A partial area of the channel of the River Finnow will be isolated for the purpose of outfall construction. Flow will be allowed to continue in the remainder of the channel.	**Lamprey & Salmonids** In-stream works will not cause an obstruction of fish and lamprey passage as a section of the channel will remain open during the works. **Freshwater Pearl Mussel*** The River Finnow has been assessed as suboptimal habitat for Freshwater Pearl Mussel. There will be no necessity to enter the River Blackwater for the purpose of the works. There is no risk of disturbance to Pearl Mussel. **Otter** Otter use the River Finnow for foraging and commuting as evidenced by otter signs identified during the ecological surveys. Bank-side works can deter otter from commuting through this area to foraging habitat. However otter are most active after dusk and before dawn. The works will be carried out during daylight hours. There is a low potential for coincidence of the works with otter activity.	**None**
Sedimentation of the Watercourse	**Site Clearance, trench excavation for outfall construction and ground excavation for tank construction** Disturbance of ground for site clearance, underground tank construction within the WWTP site and for outfall trench excavation increases the risk of sediment run-off into the local watercourses (Tanyard stream and River Finnow) from the disturbed ground and also from the stockpiled material (both excavated material and material imported to site for backfilling). The Tanyard Stream is located adjacent to the Millstreet WWTP. The ground slopes gently towards the stream. Site run off will be in the direction of the stream. Note however that a vegetated buffer will be retained between the WwTP site and the stream. This will capture sediment in the runoff. **Outfall Construction in the Finnow River**	**Atlantic Salmon** The River Finnow is an important spawning and nursery area for salmon. The River Finnow is characterised by a series of riffle-glide-pool sequences which offer refuge and cover for young salmonids. A good population of juvenile salmonids was recorded during Ecofact's 2014 and 2015 surveys. Pools are considered deep enough for holding adult salmon. The substrate in proximity to the Finnow bridge is dominated by cobble substrate, with intermediate areas of gravels. Gravels are also present in proximity to pools. Salmonids require clean gravels to support their life cycle. The infilling of clean gravel beds with sediment can render gravels unsuitable for fish and lamprey spawning. Also where sedimentation occurs during or immediately following spawning this can prevent oxygen movement into interstitial spaces and can result in death of larvae. The Tanyard stream was assessed as part of the ecological survey of the proposed	• **Direct, temporary impact on Atlantic salmon and lamprey spawning habitat by sediment deposition** • **Direct impact on juvenile salmonids through smothering** • **Direct, temporary impact on freshwater pearl mussel habitat by sediment deposition** • **Direct permanent impact on freshwater pearl**

Source (Impact)	Pathway	Receptor (Qualifying Interest)	Predicted Impact (in the absence of mitigation)
	A partial area of the channel of the River Finnow will be isolated using caisson (pre-cast concrete or steel box open at the top and bottom and lowered into the river) or similar. Flow will be allowed to continue in the remainder of the channel. There is a potential for sedimentation of the watercourse during caisson installation through bank disturbance and river bed disturbance. Also riparian vegetation removal to accommodate the outfall pipe is likely to disturb the river bank resulting in destabilisation and movement of bank material into the watercourse resulting in sedimentation of fishery habitat. Vegetation removal can also make the bank more vulnerable to erosion. The outfall pipe will require hydro-testing following construction. There is an associated risk that sediment within the pipe may be flushed into the Finnow River. **Storm Water Overflow Construction in the Tanyard Stream** The stormwater overflow to the Tanyard stream will require in-stream / bankside works with an associated risk of sedimentation of the watercourse.	Millstreet WWTP upgrade (Ecofact, 2014) as being suboptimal with respect to all life stages of salmonids taking into account its average depth. The presence of a dam on the Tanyard stream is likely to severely restrict movements of fish in this watercourse. **Lamprey** Brook lamprey spawning activity has been recorded in the Finnow River. Lamprey has similar spawning requirements to salmonids. The infilling of clean gravel beds with sediment can render gravels unsuitable for lamprey spawning. Also where sedimentation occurs during or immediately following spawning this can prevent oxygen movement into interstitial spaces and can result in death of larvae. **Freshwater Pearl Mussel *** Freshwater Pearl Mussels occur in the main channel of the Blackwater River. The closest population to the proposed WWTP upgrade works is at the confluence between the River Finnow and the Blackwater River (approximately 2.2km downstream of the location of the proposed new outfall to the River Finnow). An escape of sediment into the River Finnow could ultimately deposit within the Blackwater River, as was observed during field assessment in 2014 (albeit the source of sedimentation was in closer proximity to the Finnow-Blackwater confluence). – Adult Freshwater Pearl Mussels require clean coarse cobbles. Settlement of sediment on these cobbles can degrade / reduce availability of adult mussel habitat. – Sedimentation can cause adults to close up in order to prevent clogging of their gills. Prolonged closure can lead to the death through oxygen deprivation or starvation. – Juvenile pearl mussels inhabit less course substrate into which they can burrow. The sedimentation of interstitial spaces within this substrate can reduce oxygen availability for juvenile mussels resulting in death. – Sedimentation can cause females to prematurely release glochidia thereby reducing chance of survival. – Freshwater Pearl Mussels are reliant on the presence of juvenile brown trout / Atlantic salmon in order to complete their life cycle. Glochidia (pearl mussel larvae) are released in to the watercourse are some are inhaled by juvenile brown trout and Atlantic salmon allowing the glochidia to attach to the fish gill where they will develop. Impacts on host fish which affect their presence in the watercourse (or sections thereof) can impact on this key stage in the pearl mussel life cycle. **Otter** Otter may be indirectly impacted through a reduction in available food caused by impacts on fish populations from sedimentation of the watercourse.	**mussel population by smothering** • **Indirect impact on FPM population caused by temporary reduction in host fish population** • **Indirect, temporary impact on Otter due to reduction in fish biomass.**
Release of pollutants such as oils, chemicals and other building materials into the Tanyard Stream and Finnow River	**Materials Storage and Vehicle Movement** During construction, there is a risk of accidental release of pollutants from the following sources: • Spillage or leakage of oils and fuels stored on site or from refuelling machinery; • Spillage or leakage of oils and fuels from construction machinery or site vehicles; • The use of concrete and cement during construction; The upgrade works will be located within the vacant northern area of the existing site, which is positioned immediately adjacent to the Tanyard stream. The site slopes towards the stream. There is potential for accidental release of pollutants to the stream. The Tanyard stream is hydrologically connected to the Finnow River. There is potential also for pollution of the River Finnow, albeit the pollutants may be fully or partially assimilated by the flows in the Tanyard stream in advance of the confluence with the Finnow River. There is a risk of accidental leaks from machinery to the Finnow River during outfall construction.	**Atlantic Salmon and Lamprey** The Tanyard stream is assessed as sub-optimal habitat for salmonids. Accidental pollution of the stream is unlikely to impact upon salmonids. The Finnow River is a suitable salmonid and lamprey fishery habitat. The accidental release of building materials into the watercourse is likely to impact fish/lamprey populations through changes in pH and/ or interference with oxygen transfer. **Freshwater Pearl Mussel*** Pollution can cause adult pearl mussel to close up. Prolonged closure can lead to the death through oxygen deprivation or starvation. Pollution of the watercourse also poses the risk of pearl mussel poisoning. The pearl mussel population in the Blackwater river is not recruiting i.e. there is a almost zero success rate of juvenile survival. Therefore population recovery following a pollution incident is highly unlikely. **Otter** Otter may be indirectly impacted through a reduction in available food caused by impacts on fish populations from pollution of the watercourse.	• **Direct, temporary impact on Atlantic salmon and lamprey populations** • **Direct permanent impact on freshwater pearl mussel population** • **Indirect impact on freshwater pearl mussel population caused by temporary reduction in host fish population** • **Indirect, temporary impact on Otter due to reduction in fish**

* Freshwater Pearl Mussel is a qualifying interest of the Blackwater River SAC. However the NPWS has advised that the basis for the initial listing of freshwater pearl mussel as a qualifying interest was poorly founded. The conservation objectives for the Blackwater SAC are therefore to be revised such that the objective of maintaining or restoring freshwater pearl mussel populations in the main channel of the river will no longer be an objective.

3.1.2 Operational Stage Impacts

Table 3.2: Operational Stage Impacts

Source (Impact)	Pathway	Receptor (Qualifying Feature)	Predicted Impact (in the absence of mitigation)
Improvement in Water Quality	**Decommissioning of Outfall to Tanyard Stream** The existing Millstreet WWTP discharges into the Tanyard Stream. The upgraded treatment plant will discharge to the Finnow River. An improvement in water quality in the Tanyard stream is expected as a result of the change in discharge location. The new outfall will be located at Finnow Bridge, which is approximately 1.6km upstream of the confluence with the Tanyard stream. As such there will be an increased volume of water in which to assimilate the discharge in advance of the confluence with the main channel of the Blackwater River. **Improved Level of Treatment** The existing Millstreet WWTP comprises an extended aeration system followed by settlement. The upgraded treatment plant will provide tertiary treatment with nutrient reduction. There will be an associated improvement in the discharge quality. **Management of Stormwater Overflows** The existing storm water overflow from the Millstreet WWTP to the Tanyard Stream is unscreened and there is no stormwater retention facility at the WWTP. An improvement in water quality in the Tanyard Stream is expected as a result of the upgrade works given that the storm water overflows will be designed in accordance with DEHLG guidance on Urban Wastewater Treatment Directive (91/271/EEC) Procedures and Criteria in relation to Storm Water Overflows (March 1995). This guidance requires that 'Formula A' flow must be employed as a minimum equating approximately to 6DWF which will ensure that the "first foul flush" is captured in the WWTP and it is only the diluted effluent discharged to the environment. The new storm water overflow will also be screened which will remove a proportion of organic content.	**Atlantic Salmon** The River Finnow is a very important spawning and nursery area for salmon. The River Finnow is currently assessed as being a Q4. An improvement in water quality will be beneficial however it is unlikely to provide such a positive improvement that salmonid populations will increase significantly given that the current water quality is adequate to support good salmonid stocks. **Lamprey** Lamprey is tolerant to changes in water quality and can be found in a wide range of water quality types. Improvement in water quality is not likely to be significant in impacting lamprey populations. **Freshwater Pearl Mussel*** Ecofact's pearl mussel habitat assessment survey (2015) recorded 5-25% submerged aquatic vegetation cover at Wallis's Bridge (downstream of the existing discharge) and 25-50 % cover at Finnow Bridge (upstream of the existing discharge). Greater upstream macrophyte growth suggests that the existing discharge is not a significant contributory factor. An improvement in discharge quality is unlikely to result in reduced macrophyte growth to a sufficient level to support pearl mussel. **Otter** No impacts are expected for otter given that the potential improvement in water quality is unlikely to result in a marked increase in salmonid or lamprey populations in the Finnow River.	**None**
Pollution of the Watercourse	**Storage of Chemicals** Chemicals used in the treatment process, e.g. ferric sulphate or polyelectrolyte, will be stored within a bunded area with 110% capacity of what is being stored. The likelihood of a chemical spill to the environment from bunded areas is low. **Peak Loadings** The WWTP will be designed to accommodate a peak loading form the Green Glens Arena. Variable Speed Drive pumps and DO monitors will be installed to allow the plant operator to adjust Mixed Liquor Suspended Solid (MLSS) flows such that biological treatment can be increased or decreased according to organic load. The events in the Green Glens Arena are scheduled. The plant operator will therefore have advance knowledge of the potential for increased loading and can modify operation accordingly. The potential for peak loading to the plant to result in failures to meet emission limit values is low. **Surface Water Runoff from Sludge Treatment** Surface water drainage from the hardstanding area near the sludge tanks, i.e. where the sludge tankers will be connected for sludge removal, will be connected to a pipeline gravitating to the forward feed sump upstream of the secondary treatment stage. There is no risk of pollution to the watercourse from this area. **Release of Endocrine Disruptors to the Watercourse** Discharges from the WWTP may contain endocrine disruptors which can alter the normal hormonal function of animals thereby affecting growth, development and reproductive success. The study by Tarrant et al (2005) into the occurrence of endocrine disruptors in the Irish aquatic environment concluded that • Irish WWTP effluents are estrogenic, although levels compare favourably with other European countries and the USA; • Irish rivers and lakes do not appear to be at general risk from significant concentrations of environmental estrogens, • In general, wild fish populations do not appear to be at risk from estrogenic chemicals, and • Judging from the limited number of sites examined in this study, Irish drinking water resources	No impacts are likely given the absence of a pathway to the receptors / no evidence of sensitivity to the pressure.	**None**

Source (Impact)	Pathway	Receptor (Qualifying Feature)	Predicted Impact (in the absence of mitigation)
	do not appear to be at significant risk from estrogenic chemicals The report was caveated to say that estrogenic “hotspots” are likely in densely populated urban and/or industrialised areas. The effluent generated within the Millstreet agglomeration is primarily domestic. The future WWTP design will accommodate 3,220pe. It can be considered therefore that the conclusions of Tarrant’s study can be applied to the Millstreet WWTP discharge.		

* Freshwater Pearl Mussel is a qualifying interest of the Blackwater River SAC. However the NPWS has advised that the basis for the initial listing of freshwater pearl mussel as a qualifying interest was poorly founded. The conservation objectives for the Blackwater SAC are therefore to be revised such that the objective of maintaining or restoring freshwater pearl mussel populations in the main channel of the river will no longer be an objective.

3.2 In-combination Impacts

Article 6(3) of the Habitats Directive requires that:

Any plan or project not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually ***or in combination with other plans or projects****, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives.*

It is therefore required that the Appropriate Assessment of the Millstreet WWTP upgrade must consider the potential implications of the works in combination with any other relevant plans or projects.

3.2.1 Drishane Old Convent

Planning permission was granted on 21/11/2009 for the decommissioning of an existing septic tank at Drishane Old Convent (near Wallis' Bridge, downstream of the Millstreet WWTP) and the installation of a new wastewater treatment system to include an outfall to the Finnow River. This new waste water treatment system services the domestic wastewater generated by the Asylum Seeker Direct Provision Centre. A discharge licence was granted for the treatment system under Section 4 of the Local Government (Water Pollution) Act, 1977 on 31st May 2010 (licence number WP(W)01/10). The treatment system is operational and discharges in accordance with licence conditions as presented hereunder. Wastewater flow must not exceed 60 m^3/day.

Table 3.3: Emission Limit Values for Drishane Old Convent

Parameter	Emission Limit Value
pH	6-8.5 pH units
BOD	5mg/l
Total Suspended Solids	5mg/l
Total Phosphorous as P	0.37mg/l
Ammonia as N	5mg/l
FOG	10mg/l
Detergents	5mg/l
Hydrocarbons	2mg/l
Temperature	Not cause >1.5ºC rise in ambient

Source: Cork County Council

The potential impact of the discharge from the upgraded WWTP at Millstreet in combination with the discharge from Drishane Old Convent on the water quality in the River Finnow is therefore assessed:

Predicted Concentrations in the River Finnow Downstream of the Millstreet WWTP Discharge

Following the upgrade works to the Millstreet WWTP, the discharge will be to the Finnow River at Finnow Bridge (approximately 2km upstream of the Drishane Old Convent). Existing mean background concentrations in the Finnow River are calculated from Cork County Council water quality monitoring data at Finnow Bridge (2010-2012).

Table 3.4: River water Quality – Finnow Bridge 2010-2012

River Water Quality	Mean Concentration (mg/l)
BOD	1.039
Molybdate Reactive Phosphorous	0.0124
Ammonia (N)	0.0199

The 95%ile flow in Finnow River is 0.27m^3/sec (ref. EPA Inspectors report 16th December 2013). The calculated future effluent dry weather flow (DWF) is 0.012 m^3/sec. Normal flow is assumed at 1.5DWF, equating to 0.014 m^3/sec. The emission limit values for the future treatment plant are presented below.

Table 3.5: Treated Effluent Discharge Standards

Parameter	Units	Emission Limit Value
pH	pH units	6-9
cBOD	mg/l	25
COD	mg/l	125
Ammonia as N	mg/l	1.0
Orthophosphate as P	mg/l	0.5
Suspended solids	mg/l	25

The resultant concentrations in the Finnow River are in accordance with the requirements for Good Status waters as prescribed in the European Communities Environmental Objectives (Surface Waters) Regulations 2009 (as amended).

Table 3.6: Resultant Concentrations Downstream of the Upgraded Millstreet WWTP (mg/l)

		EQS Values (95%ile)
River Water Quality	Resultant Concentration (mg/l)	Good Status
BOD	2.22	*2.6*
Molybdate Reactive Phosphorous	0.04	*0.075*
Ammonia (N)	0.07	*0.14*

Predicted Concentrations in the River Finnow Downstream of the Drishane Old Convent Discharge

The available capacity of the River Finnow to accommodate the Drishane Old Convent discharge following the relocation of the Millstreet WWTP outfall to the Finnow River can be determined by taking the predicted

downstream concentration at the Millstreet WWTP outfall (Table 3.5) as the background concentration against which to assess the Drishane Old Convent discharge.

Table 3.7: Capacity of Finnow River to Assimilate Drishane Old Convent discharge following Relocation of Millstreet WWTP Outfall (mg/l).

River Water Quality	Background Concentration (downstream of Millstreet WWTP outfall)	Resultant Concentration (at Drishane Old Convent)	EQS Values (95%ile) Good Status
BOD	2.22	2.21	*2.6*
Ammonia (N)	0.07	0.08	*0.14*

Assimilative capacity calculations demonstrate that the relocation of the Millstreet WWTP outfall to the Finnow River will not negatively affect the capacity of the river to assimilate the downstream discharge from the Drishane Old Convent.

3.2.2 Munster Blackwater Sub-Basin Freshwater Pearl Mussel Management Plan

The Munster Blackwater Sub-Basin Freshwater Pearl Mussel Management Plan provides a programme of measures required to improve the habitat of the freshwater pearl mussel in the Blackwater Catchment. The Millstreet WWTP is identified on a prioritised list of eighteen WWTPs as a municipal discharge in the Blackwater Catchment which poses significant threat to pearl mussel or its habitat. The measures prescribed in the Management Plan require improvements at these eighteen prioritised WWTPs such that the water quality needs for Freshwater Pearl Mussel are achieved, as prescribed in the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations (S.I. 296 of 2009).

Freshwater pearl mussels are present in the main channel of the Blackwater River. The implications on water quality in the Blackwater River due to the relocation of the Millstreet WWTP outfall to the Finnow River are assessed hereunder using Mass Balance equation.

The water quality background concentrations in the Blackwater River can be taken from the EPA monitoring station at Charles Bridge (station number 18B020750). The 95%ile flow in River Blackwater is 0.45m^3/sec (Source: Hydro Station 18050). The normal flow in the Finnow River is taken as 1.536 m^3/sec (source: 50%ile flow from EPA Hydrotool to estimate flow duration curve in an ungauged catchment). The concentrations of pollutants in the River Finnow are taken from Tables 3.6 and 3.7 above (i.e. the resultant concentration for BOD and Ammonia at Drishane Old Convent, and the resultant concentration for MRP downstream of the upgraded Millstreet WWTP)

Table 3.8: Predicted downstream Concentration in the Blackwater River Downstream of the Finnow Confluence (mg/l)

River Water Quality	Background Concentration (Charles Bridge, station number 18B020750))	Finnow River Water Quality	Resultant Concentration (in the Blackwater River)	EQS Values (95%ile) High Status
BOD	1.177	2.21	1.98	*2.2*
Molybdate Reactive Phosphorous	0.017	0.04	0.03	*0.045*
Ammonia (N)	0.041	0.08	0.07	*0.09*

The assessment of the effects relocating the discharge from the Millstreet WWTP on the water quality in the River Blackwater has shown that the High Status water quality standards will continue to be achieved.

It is of note that the requirement to achieve High Status water quality standards in the main channel of the Blackwater River will no longer be a requirement following the intended amendment of the conservation objectives for the Blackwater River SAC such that there would no longer be the objective of maintaining or restoring freshwater pearl mussel populations in the main channel of the river, and also following the intended amendment of the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations (S.I. 296 of 2009) to give further effect to the alteration of the conservation objectives for the River Blackwater SAC.

3.3 Summary of Predicted Impacts

Impacts have been determined for freshwater pearl mussel (*Margaritifera margaritifera*), sea lamprey (*Petromyzon marinus*), brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*), Atlantic salmon (*Salmo salar*) and otter (*Lutra lutra*).

Likely direct negative construction stage impacts relate to:

- the release of sediments to the River Finnow which could degrade fishery habitat i.e. infill interstitial spaces in spawning gravels;
- the release of sediments to the Tanyard Stream and River Finnow which could degrade freshwater pearl mussel habitat downstream of the works, in the Blackwater River (adults require clean cobble substrate whereas juveniles require fine sediment with a high redox potential);
- removal of salmonid / lamprey spawning gravels and cobble substrate (suitable for juvenile salmonids) associated with in-stream works the River Finnow.

Indirect negative construction stage impacts relate to:

- reduced availability of fish biomass for otter because of the direct impacts on fishery habitat.

- reduced availability of host fish populations for pearl mussel because of the direct impacts on fishery habitat.

Operation stage impacts relate to:

- Improved water quality due to improved quality of effluent discharge from the WWTP which will contribute towards the attainment of high biological quality elements in the Finnow River.

4 Assessment of Impacts on Conservation Objectives

4.1 Conservation Objectives of the River Blackwater SAC

European and national legislation places a collective obligation on Ireland and its citizens to maintain habitats and species in the Natura 2000 network at favourable conservation condition. Ireland has determined site-specific conservation objectives for the Blackwater River SAC[5] which define favourable conservation condition for habitats and species for which a site is designated.

Favourable conservation status of a habitat is achieved when:

- its natural range, and area it covers within that range, are stable or increasing,
- the specific structure and functions which are necessary for its long-term maintenance exist and are likely to continue to exist for the foreseeable future, and
- the conservation status of its typical species is favourable.

The favourable conservation status of a species is achieved when:

- population dynamics data on the species concerned indicate that it is maintaining itself on a long term basis as a viable component of its natural habitats, and
- the natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future, and
- there is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

Potential impacts on the conservation objectives of the River Blackwater SAC are assessed in Table 4.1. These impacts are assessed **in the absence of mitigation**. Impacts are assessed relative to their potential to negatively impact on the structure, function, and integrity of the site's qualifying features and conservation objectives. The qualifying features under consideration are those which have been determined through source-pathway-receptor assessment to be at risk of being impacted by the proposed upgrade to the Millstreet WWTP.

[5] Full details are provided in NPWS (2012) Conservation Objectives: Blackwater River (Cork/Waterford) SAC 002170. Version 1.0.

Table 4.1: Assessment of Impacts on Conservation Objectives of the Blackwater River SAC

Qualifying Interest	Conservation Objectives	Assessment of Impact Significance
Freshwater Pearl Mussel (Margaritifera margaritifera) [1029]	Communication was received from NPWS on 4th February 2016 advising that the decision was taken to amend the conservation objectives for freshwater pearl mussel in the Blackwater River SAC on the basis that initial listing of freshwater pearl mussel as a qualifying interest was poorly founded due to inadequate information. NPWS advised that the following course of action will be taken in this regard: • Amend the conservation objectives of the Blackwater River SAC in order that there would no longer be the objective of maintaining or restoring freshwater pearl mussel populations in the main channel of the river; • Retain the conservation objectives for the freshwater pearl mussel in the Lickey and Allow tributaries of the Blackwater, which are included in the SAC; • Notify the Commission of the change; • Amend the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations (S.I. 296 of 2009) to give further effect to the alteration of the conservation objectives for the River Blackwater SAC.	The closest population of freshwater pearl mussel to the proposed WWTP upgrade works is in the main channel of the Blackwater River. There are no pearl mussels in the Finnow River. NPWS has advised that freshwater pearl mussel is no longer a conservation interest in the main channel of the Blackwater River. Any potential impacts on freshwater pearl mussel from sedimentation or accidental pollution associated with the construction of the WwTP outfall and storm water overflow cannot therefore have significant effects on the conservation objectives for freshwater pearl mussel in the SAC. There will be ***no potential significant effects*** on freshwater pearl mussel in the Blackwater River SAC.
Sea lamprey (Petromyzon marinus) [1095]	**Distribution** - Greater than 75% of the main stem length of rivers in the SAC should be accessible from the estuary. Artificial barriers can block or cause difficulties to lampreys' upstream migration. **Extent and distribution of spawning habitat** - No decline in extent and distribution of spawning beds **Population structure of juveniles** - At least three age/size groups present **Juvenile density in fine sediment** - at least 1/m² **Availability of juvenile habitat** - More than 50% of sample sites positive	**Distribution** - Outfall construction in the River Finnow and Tanyard Stream will not impede fish passage. – ***No potential significant effects*** **Extent and distribution of spawning habitat -** River habitat at the location of the proposed outfall on the Finnow River comprises riffles and stony substrates with an evenly proportioned distribution of rock, cobble and gravels. Downstream habitat comprised riffle-pool sequences with gravel beds on the downstream ends of pools. There are no recent records for sea lamprey spawning in the Finnow River and it is not known if the habitat at the Finnow bridge is utilised by adult sea lamprey. Impact on adult spawning by direct removal and/or sedimentation /pollution cannot therefore be disqualified. - ***Potential Significant Effects on Spawning Habitat*** are assumed following the precautionary principle. **Population structure, density and available habitat for Juveniles -** Juvenile lampreys were recorded in the 2004 survey of the Blackwater catchment at Finnow Bridge (King and Linnane, 2004). This was the only location surveyed on the Finnow River. The survey recorded a population density of 8 individuals / m^2. Of note is that the population differed from all other sites surveyed in the Blackwater Catchment in that it was dominated by sea lamprey indicating the importance of the Finnow River as a sea lamprey nursery habitat. Suitable habitat for juvenile lamprey was not recorded in the River Finnow during Ecofact's 2014 and 2015 ecological surveys. The conservation objective for juvenile lamprey present at >50% of surveyed sites pertains to the entire SAC. The removal of river substrate to accommodate the outfall construction at Finnow Bridge will not result in the removal of juvenile lamprey habitat, on the basis of the most recent surveys of the outfall location. A significant negative effect on the integrity of the SAC will not occur considering the sites Conservation Objectives. – ***No potential significant effects***
Brook lamprey (Lampetra planeri) [1096]	**Distribution** - Access to all water courses down to first order streams **Extent and distribution of spawning habitat** - No decline in extent and distribution of spawning beds **Population structure of juveniles** - At least three age/size groups present **Juvenile density in fine sediment** - at least 2/m² **Availability of juvenile habitat** - More than 50% of sample sites positive	**Distribution** - Outfall construction in the River Finnow and Tanyard Stream will not impede fish passage. – ***No potential significant effects*** **Extent and distribution of spawning habitat –** Brook lamprey spawning activity was recorded in the River Finnow previously by Ross (2009). River habitat at the location of the proposed outfall on the Finnow River comprises riffles and stony substrates with an evenly proportioned distribution of rock, cobble and gravels. Downstream habitat comprised riffle-pool sequences with gravel beds on the downstream ends of pools. Minor levels of siltation from natural land runoff are evident. Sedimentation and pollution during construction may degrade spawning habitat. Removal of river substrate to accommodate the outfall construction will result is loss of suitable spawning habitat from the watercourse. ***Potential Significant Effects on Spawning Habitat*** **Population structure, density and available habitat for Juveniles -** Juvenile lampreys were recorded in the 2004 survey of the Blackwater catchment at Finnow Bridge (King and Linnane, 2004). This was the only location surveyed on the Finnow River. The survey recorded a population density of 8 individuals / m^2. Of note is that the population differed from all other sites surveyed in the Blackwater Catchment in that it was dominated by sea lamprey indicating the importance of the Finnow River as a sea lamprey nursery habitat. Suitable habitat for juvenile lamprey was not recorded in the River Finnow during Ecofact's 2014 and 2015

Qualifying Interest	Conservation Objectives	Assessment of Impact Significance
		ecological surveys. The conservation objective for juvenile lamprey present at >50% of surveyed sites pertains to the entire SAC. The removal of river substrate to accommodate the outfall construction at Finnow Bridge will not result in the removal of juvenile lamprey habitat, on the basis of the most recent surveys of the outfall location. A significant negative effect on the integrity of the SAC will not occur considering the sites Conservation Objectives. – ***No potential significant effects***
River lamprey (Lampetra fluviatilis) [1099]	**Distribution** - Access to all water courses down to first order streams **Extent and distribution of spawning habitat** - No decline in extent and distribution of spawning beds **Population structure of juveniles** - At least three age/size groups present **Juvenile density in fine sediment** - at least 2/m² **Availability of juvenile habitat** - More than 50% of sample sites positive	**Distribution** - Outfall construction in the River Finnow and Tanyard Stream will not impede fish passage. – ***No significant impact*** **Extent and distribution of spawning habitat -** River habitat at the location of the proposed outfall on the Finnow River comprises riffles and stony substrates with an evenly proportioned distribution of rock, cobble and gravels. Downstream habitat comprised riffle-pool sequences with gravel beds on the downstream ends of pools. Minor levels of siltation from natural land runoff are evident. Sedimentation and pollution during construction may degrade spawning habitat. Removal of river substrate to accommodate the outfall construction will result is loss of suitable spawning habitat from the watercourse ***Potential Significant Effects on Spawning Habitat*** **Population structure, density and available habitat for Juveniles -** Juvenile lampreys were recorded in the 2004 survey of the Blackwater catchment at Finnow Bridge (King and Linnane, 2004). This was the only location surveyed on the Finnow River. The survey recorded a population density of 8 individuals / m^2. Of note is that the population differed from all other sites surveyed in the Blackwater Catchment in that it was dominated by sea lamprey indicating the importance of the Finnow River as a sea lamprey nursery habitat. Suitable habitat for juvenile lamprey was not recorded in the River Finnow during Ecofact's 2014 and 2015 ecological surveys. The conservation objective for juvenile lamprey present at >50% of surveyed sites pertains to the entire SAC. The removal of river substrate to accommodate the outfall construction at Finnow Bridge will not result in the removal of juvenile lamprey habitat, on the basis of the most recent surveys of the outfall location. A significant negative effect on the integrity of the SAC will not occur considering the sites Conservation Objectives. – ***No potential significant effects***
Salmon (Salmo salar) [1106]	**Distribution** - 100% of river channels down to second order accessible from estuary **Adult spawning fish** - Conservation Limit (CL) for each system consistently exceeded. **Salmon fry abundance** - Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. **Out-migrating smolt abundance** - No significant decline **Number and distribution of redds** - No decline in number and distribution of spawning redds due to anthropogenic causes **Water quality** - At least Q4 at all sites sampled by EPA	Note: *The River Finnow (downstream of the confluence with the Tanyard Stream) was subjected to in-stream works in 2014 including removal of river bed material and has been seriously degraded with respect to salmonid habitat. Downstream areas were covered with a layer of silt as a result of the in-stream works, decreasing the value with regard to fish habitats.* **Distribution** - The Tanyard stream is a third order stream in the Blackwater River catchment. The stream was assessed as part of the ecological survey of the proposed Millstreet WWTP upgrade (Ecofact, 2014) as being suboptimal with respect to all life stages of salmonids taking into account its average depth. The presence of a dam on the Tanyard stream is likely to severely restrict movements of fish in this watercourse. Works in the Tanyard Stream will not impact on the 'Distribution Target' for Atlantic Salmon given that the Tanyard is a third order stream and given the existing sub-optimal condition of the watercourse to support salmonids. - ***No potential significant effects*** The River Finnow (a second order river in the Blackwater Catchment) is an important spawning and nursery area for salmon. Outfall construction in the River Finnow will not impede fish passage. – ***No potential significant effects*** **Adult spawning fish** - The conservation limit for the River Blackwater is currently being achieved. The catchment has been assigned a status of Not Threatened with Loss. The conservation requirement (number of fish) is 13548 comprising 1045 multi-sea winter stock and 12503 one sea winter stock. The upgrade works to the Millstreet WWTP will not impede salmon movement to spawning sites. The in-stream works will not be permitted during the closed (spawning) season, the timing of which has been confirmed by Inland Fisheries Ireland to be between October and June inclusive to accommodate the latent spawning season in the south of Ireland (i.e. in-stream works will be required to be carried out during the summer period July-September). - ***No potential significant effects*** **Salmon fry abundance and smolt abundance** – Ecofact's survey in 2014 and 2015 of the River Finnow and the Blackwater River noted a healthy stock of juvenile salmon. The excavation of a small section of riffle habitat in the River Finnow to accommodate outfall construction will not alter the mean catchment-wide fry abundance nor will it influence smolt abundance. - ***No potential significant effects***

Qualifying Interest	Conservation Objectives	Assessment of Impact Significance
		Number and distribution of redds - The River Finnow is characterised by a series of riffle-glide-pool sequences which offer refuge and cover for young salmonids. Gravels at the downstream end of pools are considered optimal spawning areas for salmonids. River habitat at the location of the in-stream works in the Finnow comprises of riffles and stony substrates with an even distribution of rock, cobbles, and gravels. Outfall construction can result in the direct excavation of spawning gravels from the watercourse. Sedimentation and pollution can affect downstream spawning gravels during in-stream works. ***Potential Significant Effects on Spawning Habitat*** **Water quality** - Upgrade works to the Millstreet WWTP will improve the discharge quality to the Blackwater catchment and is therefore likely to have an overall positive impact on water quality. - ***No potential significant effects***
Otter (Lutra lutra) [1355]	**Distribution** - FCS target is 88% in SACs. Current range in south-west estimated at 74.5% **Extent of terrestrial habitat** - No significant decline. Area mapped and calculated as 1165.7ha along river banks/ around ponds. **Extent of freshwater (river) habitat** - No significant decline. Length mapped and calculated as 599.54km **Extent of freshwater (lake) habitat** – No significant decline. Area mapped and calculated as 25.06ha **Couching sites and holts** - No significant decline **Fish biomass available** – No significant decline **Barriers to connectivity** - No significant decline	**Distribution and Habitat Extent** - Evidence of otter was found on the River Finnow during ecological survey. There will be no impacts on distribution of otter on the watercourse and there will be no loss of habitat for otter. - ***No potential significant effects*** **Couching sites and holts** - No holts (otter dwellings) or couches were recorded along the River Finnow . - ***No potential significant effects impact*** **Barriers to connectivity** - Works associated with the construction of the outfall pipe at the confluence between the Finnow and Tanyard has the potential to deter Otter from commuting through this area during times of construction. However construction activities will be during day light hours when otter are less active therefore the impact will not significantly impact otter commuting. - ***No potential significant effects*** **Fish biomass available** - There is a risk of pollution / sedimentation of the watercourse by in-stream works which could result in a reduction of fish biomass (either by death or avoidance behaviour). However given the extent of the Blackwater catchment coupled with the existing healthy fishery populations in the river and its tributaries, a localised decline in fish populations in proximity to the WWTP during construction works will not be significant. - ***No potential significant effects***

5 Mitigation Measures

5.1 Mitigation

Measures to reduce / minimise the impacts of in-stream works, sedimentation and pollution on the fishery habitat within the Finnow River are presented such that significant effects on the conservation objectives for lamprey and Atlantic salmon within the Blackwater River SAC are negated.

The mitigation prescribed in this NIS is required to be adopted into Contract Documents for the upgrade works to the Millstreet WWTP. The implementation of mitigation is therefore a contractual obligation of the Contractor appointed to carry out the works.

The prescribed mitigation has been developed with regard to proven best practice site operating procedures including

- Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works
- Office of Public Works (2011) Environmental Management Protcols and SOPs
- Mulkear LIFE (2016) Best Practice Guide Number One: Enhancement of Atlantic Salmon Population and Biodiversity Considerations of Habitat Restoration in SACs
- Mulkear LIFE (2016) Best Practice Guide Number Two: Management of Upstream Passage for Adult Sea Lamprey in SACs.

The specified mitigation will ensure no net loss of salmonid and lamprey spawning habitat and will ensure that the lamprey and Atlantic salmon populations in the River Finnow are not impacted by the upgrade works to the Millstreet WWTP. The mitigation prescribed is best practice and has been successfully employed in Ireland on development sites.

The Millstreet WWTP will be designed, operated, and monitored in accordance with the authorisation (and any future amendments thereof) granted by the EPA under the Waste Water Discharge (Authorisation) regulations 2007, as amended.

5.1.1 Damage to Fishery Habitat

Outfall construction may require the excavation of substrate from the river bed. The river bed comprises an even distribution of rock, cobble and gravel with a small proportion of fine sediment within riffle habitat at the Finnow Bridge. This is suitable spawning habitat for lamprey and salmonids. Also the fine sediment deposits may be suitable juvenile lamprey habitat. Measures to reduce the impacts on fishery habitat are identified hereunder:

1. Inland Fisheries Ireland (IFI) has prescribed that the outfall should be sited within riffle habitat to maximise effluent dispersion. The location of the outfall must be identified on site in consultation with IFI such that the need to excavate spawning gravels and suitable juvenile lamprey habitat is minimised.

2. The in-stream works will not be permitted during the closed (spawning) season, the timing of which has been confirmed by Inland Fisheries Ireland to be between October and June inclusive to accommodate the latent salmonid spawning season in the south of Ireland. The works must also accommodate the sea lamprey spawning (from late April to early July). Therefore in-stream works will be required to be carried out during the summer period from mid-July to September.

3. Cobbles and gravels excavated from the River Finnow shall be retained, stored and protected bank-side (>10m from the watercourse). This material will be reinstated following the works, in consultation with IFI.

4. All river bed material removed from the Finnow River and the Tanyard Stream will be examined, by a suitably qualified ecologist, immediately following removal and three times daily thereafter for the presence of juvenile lamprey. Any juvenile lamprey will be collected and returned to an upstream section of the Finnow River which, through consultation with IFI, has been identified as suitable juvenile lamprey habitat.

5.1.2 Sedimentation of the Watercourse

Sources of sedimentation from the upgrade to the Millstreet WWTP are:

- Site clearance, trench excavation for outfall construction and ground excavation for tank construction;
- Outfall Construction in the River Finnow and Storm Water Overflow Construction in the Tanyard Stream, including hydro-testing.

Measures to control sediment run-off from land and to control the release of sediment into the watercourses are identified hereunder.

1. Best environmental practice prescribed under the CIRIA publication ‘Environmental good practice on site guide (C741)’ must be followed. This guidance requires pollution control measures to be employed on site including sediment control, appropriate storage of materials and location of refuelling points away from watercourses, appropriate dewatering of cuts etc.

2. Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters must be employed.

3. Inland Fisheries Ireland shall be contacted by the Contractor prior to active site works commencing in order to agree environmental protection methods. This is a requirement of IFI in their consultation with on these proposed works.

4. In so far as is practicable, site clearance should be conducted on a staged basis and soil contouring / ridging should be carried out immediately after exposure in order to control erosion.

5. A vegetated buffer of a minimum width of 10m shall be maintained between site works and the Tanyard Stream such that sediment runoff can be assimilated by the vegetated zone. Construction vehicles shall not be permitted to enter this area and the vegetated zone shall be protected with fences (line and wire) and signs.

6. Temporary storage of spoil material or backfill material for the WWTP site and outfall trench will be stored 50m from any surface waters including drains and will be within bunded areas and will not be left exposed. The material will be covered by geotextile or similar to prevent exposure to wind and rain. Visual inspection of bunds shall be conducted on a daily basis.

7. Temporary construction offices / storage areas etc. shall be located at least 50m from watercourses.

8. Construction works in the Tanyard Stream (storm overflow) and the River Finnow (outfall pipe) will require isolation and de-watering of the work area to create dry working conditions. Only a partial area of the channel will be isolated. Flow will be allowed to continue in the remainder of the channel for fish passage. The contractor will be required to isolate the works area in an environmentally sound manner such that any trapped fish or lamprey trapped will be safely removed by electrofishing (IFI will carry out de-stocking of the works area). The in-stream works will not be permitted during the closed (spawning) season, the timing of which has been confirmed by Inland Fisheries Ireland to be between October and June inclusive to accommodate the latent spawning season in the south of Ireland (i.e. in-stream works will be required to be carried out during the summer period July-September). The material used to isolate the works area from flows shall be inspected daily for movement, leakage and general deterioration and remedial measures immediately taken where necessary.

9. Excavated river bed material which must be reinstated following the works will be reinstated in the dry to reduce the potential for sedimentation of the watercourse.

10. Any isolated areas of river / stream shall be re-watered and allowed to settle before removing the barriers to avoid sudden ingress of water causing erosion / sedimentation. Straw bales shall be installed downstream of the in-stream work in advance of the removal of the barriers and shall only be removed from the watercourse where inspection shows no visible evidence of silt plume. Vehicles shall not enter the watercourse for the purpose of straw bale installation or removal. Machinery with lifting arms will be used.

11. Bank-side works shall be conducted in dry weather conditions to reduce runoff. Straw mulch (or other appropriate alternative) shall be used to stabilise exposed ground and to reduce runoff.

12. The Contractor, in accordance with Inland Fisheries Ireland requirements, will install bank protection at the outfall points and neighbouring banks to avoid localised erosion during the works. Also the outfall designs will include bank stabilisation / protection.

13. Outfall pipe hydro-testing will be completed when the discharge is contained in isolation of the River Finnow and dewatering of the works area to an appropriate settlement area will take place.

14. Dewatering of isolated areas of watercourses shall not be in to the adjacent surface waters but shall be to a dedicated treatment area which may include silt basins and/or silt traps. Similarly drilling fluid / slurry removed from directional drilling shall be directed to a settlement area. The Contractor must ensure appropriate detention times to achieve removal of finer sediments (silts / clays). The necessity to add flocculating agents should also be assessed. The outlet of the basin / trap must be so designed to prevent scouring / erosion of the receiving waterbody. The Contractor must ensure that the volume of water diverted to the silt basis does not inundate the drainage system and sediment control basins / traps. If there is risk of overtopping the sedimentation basins / traps the contractor must cease dewatering / directional drilling until such time as the basin has drained sufficiently to accommodate the pumped flows. Daily sampling of the drainage from the sediment basins shall be conducted for suspended solids (SS). SS shall be less that 25mg/l in the outfall from the basins (it should be noted that while discharges from construction activities are not licensable under the Water Pollution Act, 1977, the limit of 25mg/l is comparable with the limit prescribed by the EPA for the Millstreet WWTP). The outfall from the settlement facilities shall be such that it does not cause erosion / scouring of the receiving watercourse.

15. Visual inspection of the Tanyard stream and Finnow River, downstream of the works shall be conducted daily. Visual inspection should show no indication of increased sediment deposition on the watercourse bed and no visible hydrocarbon film.

5.1.3 Release of pollutants such as oils, chemicals and other building materials into the Tanyard Stream and Finnow River During Construction

1. All plant and machinery shall be inspected for leaks prior to working in-stream or adjacent to watercourses. Drip trays shall be installed on all plant working in-stream or adjacent to watercourses.

2. Chemicals to be used on site (including concrete / cement, fuels / lubricants) will be stored within a bunded area with 110% capacity of what is being stored. Drainage from the bunded area(s) shall be diverted for collection and safe disposal.

3. Pipe work will be pre-fabricated and installed in the dry thereby reducing risk of pollution.

4. Concrete will be mixed off–site and imported to the site

5. When using concrete on site (until such time as it has cured) a portable pH meter must be used to measure upstream and downstream of the works areas for changes in alkalinity which will indicate pollution by concrete. The Contractor should have an emergency protocol in place for dealing with accidental release of concrete into the watercourses. This should include the requirement to immediately contacting Inland Fisheries Ireland in the event of a spillage or an increase in pH from upstream to downstream which is in excess of +/- 0.5pH units.

6. Fuelling and lubrication of equipment shall not be carried out close to watercourses. Refuelling of construction vehicles and the addition of hydraulic oils or lubricants to vehicles, will take place in a designated area (of the site, which will be set back >30m from drains and watercourses.

7. A suitably sized drip tray will be used beneath all machinery with potential pollution capabilities e.g. generators, pumps etc. used on site in order to contain any spillages / leaks that may occur.

8. Spill kits and hydrocarbon adsorbent packs will be available onsite and staff will be trained in their use.

6 Conclusions and Natura Impact Statement

Millstreet WWTP

The wastewater treatment plant (WWTP) in Millstreet was constructed in the early 1970s. The design capacity of the WWTP is 1,600 population equivalents (pe). The primary discharge is to the Tanyard Stream. The existing wastewater loading to the treatment plant (excluding that from the Green Glens Arena) has been calculated as 2,032 3pe. The wastewater comprises mainly of domestic effluent. It is calculated that an additional loading of up to 833pe is received at the treatment plant during large events at the Green Glens Arena (typically hosted 4 times per year).

A Wastewater Discharge Authorisation Licence was issued for the Millstreet agglomeration by the EPA in February 2014 (Reg. No. D0332-01). The authorisation prescribes Specified Improvement Works which were to be completed by 31 December 2015. These improvement works require the installation of a wastewater treatment plant with nutrient reduction and the discontinuance of the primary discharge to the Tanyard Stream. The licence conditions reflect the measures the Munster Blackwater Sub-Basin Freshwater Pearl Mussel Management Plan. Irish Water intend to seek planning approval from Cork County Council to upgrade the Millstreet WWTP such that the Specified Improvement Works prescribed under the licence are achieved.

Screening for Appropriate assessment

Proposals to upgrade the Millstreet WWTP were subjected to Screening for Appropriate Assessment in June 2015, in accordance with the requirements of Articles 6(3) and 6(4) of Council Directive 92/43/EEC. The screening assessment determined **Potential Significant effects** on the Blackwater River SAC (site code: 002170).

Natura Impact Statement

This Natura Impact Statement provides a complete, precise, and scientifically robust assessment of possible impacts of the proposed upgrade to the Millstreet WWTP on the integrity of the Blackwater River SAC.

In the development of this Natura Impact Statement, potential impacts of the upgrade to the Millstreet WWTP on the qualifying interests of the Blackwater River SAC were determined. The likely impacts of the works relate to the construction stage of the project. Negative operation stage impacts were determined as unlikely due to the plant design requirements to achieve a high level of effluent treatment in advance of discharge. Likely direct negative construction stage impacts relate to:

- the release of sediments to the River Finnow which could degrade fishery habitat i.e. infill interstitial spaces in spawning gravels;
- the release of sediments to the Tanyard Stream and River Finnow which could degrade freshwater pearl mussel habitat downstream of the works, in the Blackwater River (adults require clean cobble substrate whereas juveniles require fine sediment with a high redox potential);
- removal of salmonid / lamprey spawning gravels and cobble substrate (suitable for juvenile salmonids) associated with in-stream works the River Finnow.

Indirect negative construction stage impacts relate to:

- reduced availability of fish biomass for otter because of the direct impacts on fishery habitat.
- reduced availability of host fish populations for pearl mussel because of the direct impacts on fishery habitat.

The potential for the likely impacts of the upgrade works to negatively impact on the structure, function, and integrity of the Blackwater River SAC was determined having regard to the site-specific conservation objectives for the qualifying features of the site. These conservation objectives provide detailed measurable targets relative to the ecology of individual species or habitats for which a site is designated which must be achieved or maintained to meet favourable conservation status. The impacts were assessed as significant where the conservation objectives of a Natura 2000 site would be undermined.

- The effects of sedimentation on fishery habitat are assessed as **'significant'** given that there would be an associated reduction in suitable spawning habitat for lamprey and salmon;
- The effects of sedimentation on freshwater pearl mussel were assessed as 'not significant' given that freshwater pearl mussel is no longer a conservation interest in the main channel of the Blackwater River;
- The effects of damage to fishery habitat are assessed as **'significant'** given that there would be an associated reduction in suitable spawning habitat for lamprey and salmon;
- The effects of reduced fish biomass on Otter are assessed as 'not significant' on the basis that a localised decline in fish would not constitute a significant reduction in the availability of food source to otter in the Blackwater catchment.
- The effects of reduced fish biomass on freshwater pearl mussel were assessed as 'not significant' given that freshwater pearl mussel is no longer a conservation interest in the main channel of the Blackwater River;

Significant effects have been determined for Atlantic Salmon and Lamprey within the Blackwater River SAC.

This Natura Impact Statement prescribes mitigation measures which will be employed under Contract to ensure no significant effects on the integrity of the Blackwater River SAC. Mitigation is prescribed such that in-stream works and river-side works will be managed to prevent sedimentation and pollution of the Tanyard Stream, River Finnow, and Blackwater River. Mitigation is prescribed to will ensure no net loss of salmonid and lamprey spawning habitat and to ensure that the lamprey and Atlantic salmon populations in the River Finnow are not impacted by the upgrade works to the Millstreet WWTP.

The assessment of the project alone and in combination with other projects and plans, including the implementation of mitigation measures, clearly demonstrates that no adverse effects on site integrity will arise to the Blackwater River SAC in view of its conservation objectives.

This Natura Impact Statement will assist the Competent Authority in carrying out an Appropriate Assessment of the proposed upgrade to the Millstreet WWTP.

7 References

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Appendices

Appendix A. Stakeholder Correspondence

Comhairle Contae Chorcaí
Cork County Council

Planning Policy Unit,
Floor 13,
County Hall,
Cork, Ireland.
Tel: (021) 4285900
Web: www.corkcoco.ie
Aonad Polasaí Pleanála
Úrlar 13,
Halla an Chontae,
Corcaigh, Éire.
Fón: (021) 4285900
Suíomh Gréasáin: www.corkcoco.ie

Cork County Council Memorandum

I note the position and approve of the approach as outlined herein.

Tim Lucey
Chief Executive
16/2/16.

Date: 12th February 2016 **Ref:** PPU/ AH

To: Tim Lucey, Chief executive

From: James Fogarty, John O'Neill, Andrew Hind

Re: **River Blackwater SAC and Fresh Water Pearl Mussel**

Following lengthy discussions and correspondence with both the DAHG and DoECLG, on the 4th February 2016 the attached e-mail was received from Ciaran O'Keeffe who is the head of research in the National Parks & Wildlife Service.

The e-mail indicates that the Department have decided as follows:

a) To amend the conservation objectives for the Blackwater SAC, so that there would no longer be the objective of maintaining or restoring mussel populations in the main channel of the river, ;

b) To retain conservation objectives for the mussel in the Lickey and Allow tributaries of the Blackwater, which are included in the SAC;

c) To notify the Commission of the change;

d) To amend the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. (S.I. 296 of 2009) to give further effect to the alteration of the conservation objectives for the River Blackwater SAC ; and

e) pending further monitoring and other scientific work on mussels in the least suitable rivers, to enter into discussions with the Commission on changes to conservation objectives for those rivers.

The Department expect to issue revised Conservation Objectives for the River Blackwater SAC within the next few weeks and to put in train the necessary regulatory changes thereafter.

The decision taken by the Department is a significant matter affecting both the Appropriate Assessment process and the determination of planning applications and, up until the issue of revised Conservation Objectives for the SAC, it is considered appropriate for County Council

officials to take account of this e-mail in the discharge of their duties particularly with regard to issues affecting the main channel of the River Blackwater.

Once revised Conservation Objectives have been issued by the Department, it will be possible to determine the appropriate approach to issues affecting the River Allow and its catchment

James Fogarty, Divisional Manager 12/02/2016

John O'Neill, Director of Service (Planning) 12/02/2016

Andrew Hind, Senior Planner 12/02/2016

Andrew Hind

From: Ciaran O'Keeffe - (DAHG) [Ciaran.OKeeffe@ahg.gov.ie]
Sent: 04 February 2016 16:23
To: Andrew Hind; Sharon Casey
Subject: Blackwater River conservation objectives

Dear Andrew and Sharon

You will be aware that we took a view some years ago that the listing of pearl mussel as a qualifying interest in some rivers in SACS had been poorly founded due to inadequate information, at the time of site selection, about their status; and that maintenance /restoration would be an impossible target. Serious concerns have been raised recently in regard to the impacts of this listing, and the conservation objectives, on normal socio economic activities along the Blackwater River, causing us to re-visit a proposal for delisting made in 2011 to the EU Commission.

I have approval from Asst Sec for the following course of action :

- To amend the conservation objectives for the Blackwater SAC, so that there would no longer be the objective of maintaining or restoring mussel populations in the main channel of the river, ;
- To retain conservation objectives for the mussel in the Lickey and Allow tributaries of the Blackwater, which are included in the SAC;
- To notify the Commission of the change;
- To amend the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. (S.I. 296 of 2009) to give further effect to the alteration of the conservation objectives for the River Blackwater SAC ; and
- pending further monitoring and other scientific work on mussels in the least suitable rivers, to enter into discussions with the Commission on changes to conservation objectives for those rivers.

We are starting this work now. The change to the conservation objectives will take only a couple of weeks I hope; the drafting of changes to the Regulations will commence now but of course cannot proceed without the appointment of a new Minister and preparation of a brief etc.

Happy to discuss further – phone number below.

Regards
Ciaran

Ciaran O'Keeffe
National Parks and Wildlife Service
Department of Arts Heritage and Gaeltacht
7 Ely Place
Dublin 2
Ireland
tel +3531 888 3295

Mansfield, Rita

From: Andrew Gillespie <Andrew.Gillespie@fisheriesireland.ie>
Sent: 03 December 2014 12:40
To: Mansfield, Rita
Subject: FW: Millstreet WWTP new pipeline and discharge point

Rita,

With respect to our recent telephone conversation I can confirm that given the general good ground conditions and level topography of the site observed during my inspection Inland Fisheries Ireland would consider that in this instance your proposed setback of 10 metres for the pipeline route is adequate for the projection of the fisheries resource. This setback is of course deemed adequate where due diligence regarding other mitigation measures and good practice are applied during active site works.

Regards

Andrew

Andrew Gillespie

Fisheries Environmental Officer

Iascach Intíre Éireann

Inland Fisheries Ireland

Tel + 353 (0)25 32795

Mob +353 (0)87 1228355

Email andrew.gillespie@fisheriesireland.ie

Web www.fisheriesireland.ie

Sunnyside House, Macroom, Co. Cork, Ireland.

From: Andrew Gillespie
Sent: 03 December 2014 12:09
To: 'Mansfield, Rita'
Subject: Millstreet WWTP new pipeline and discharge point

Rita,

Thank you on behalf of IFI for seeking its observations regarding the construction of a new pipeline and discharge point for the Millstreet municipal WWTP. It is noted that the proposed discharge point for the upgraded plant will be to the larger Finnow river with its according greater assimilative capacity. It is most likely that such a development will overall improve the existing biological quality of the Tanyard stream and its potential productivity as a spawning and nursery stream for salmonid fish..

As a considerable element of the construction work for the new pipeline will be in proximity to the Tanyard stream and Finnow river, good practice with regards the protection of the same via mitigation measures associated with site activity eg silt control, location of refueling points, biosecurity etc. and structure design should be observed. IFI should be contacted prior to active site works commencing in order to meet site contractors regarding the former of these issues.

The pipeline route and related site works should be set back sufficiently from the riparian zone to allow adequate space for the emplacement of silt mitigation measures where deemed necessary and to allow for a natural spacial buffer to reduce disturbance to the riparian zone or accidental discharges to the watercourse itself.

Where the line of the pipe laying involves the crossing of any watercourse the design of the same should be result in no alteration to the existing route of the watercourse or local damage or weakness to the banks at the crossing point. Piped crossings of watercourses are often carried to this effect by under-boring the channel bed from setback points from the bank for purposes similar to those described for the general setback for the pipeline route.

The construction of the outfall point on the River Finnow will entail some degree of in-stream activity and therefore be required to be carried out during the summer period July-September inclusive to minimise the potential for disturbance to the migration and spawning of adult salmonids and the early stages of salmonid juveniles. IFI should be contacted a minimum of one week prior to the diversion works proceeding to allow for scheduling of inspection and where necessary the fish de-stocking of the intended work area prior to dewatering.

The location of the outfall should take account of the nature of flow in the river in order to allow for the maximum potential for mixing at the immediate point of the outfall ie it would be beneficial to site the outfall in an area of riffle rather into a deep scour pool which may result in considerable local deterioration in water quality especially during dry flow periods.

Where en-situ casting is required for concrete structures all works must be carried out in the dry and isolated from the active river channel. This may be carried out via either temporary diversion of part or the entire channel to create a dry work area. As this work will be carried out on only one confined location on a single bank of the river it is likely that a partial diversion of the channel will be sufficient to allow for works to proceed while minimizing the overall level of disturbance to the river.

The outfall point and neighbouring banks should be protected, where necessary, by rock armouring to avoid localized erosion which may result due to the disturbance of banks associated with the works.

I am happy to further discuss these matters at your convenience if you require further input from IFI on the same.

Andrew Gillespie

Fisheries Environmental Officer

Iascach Intíre Éireann

Inland Fisheries Ireland

Tel + 353 (0)25 32795

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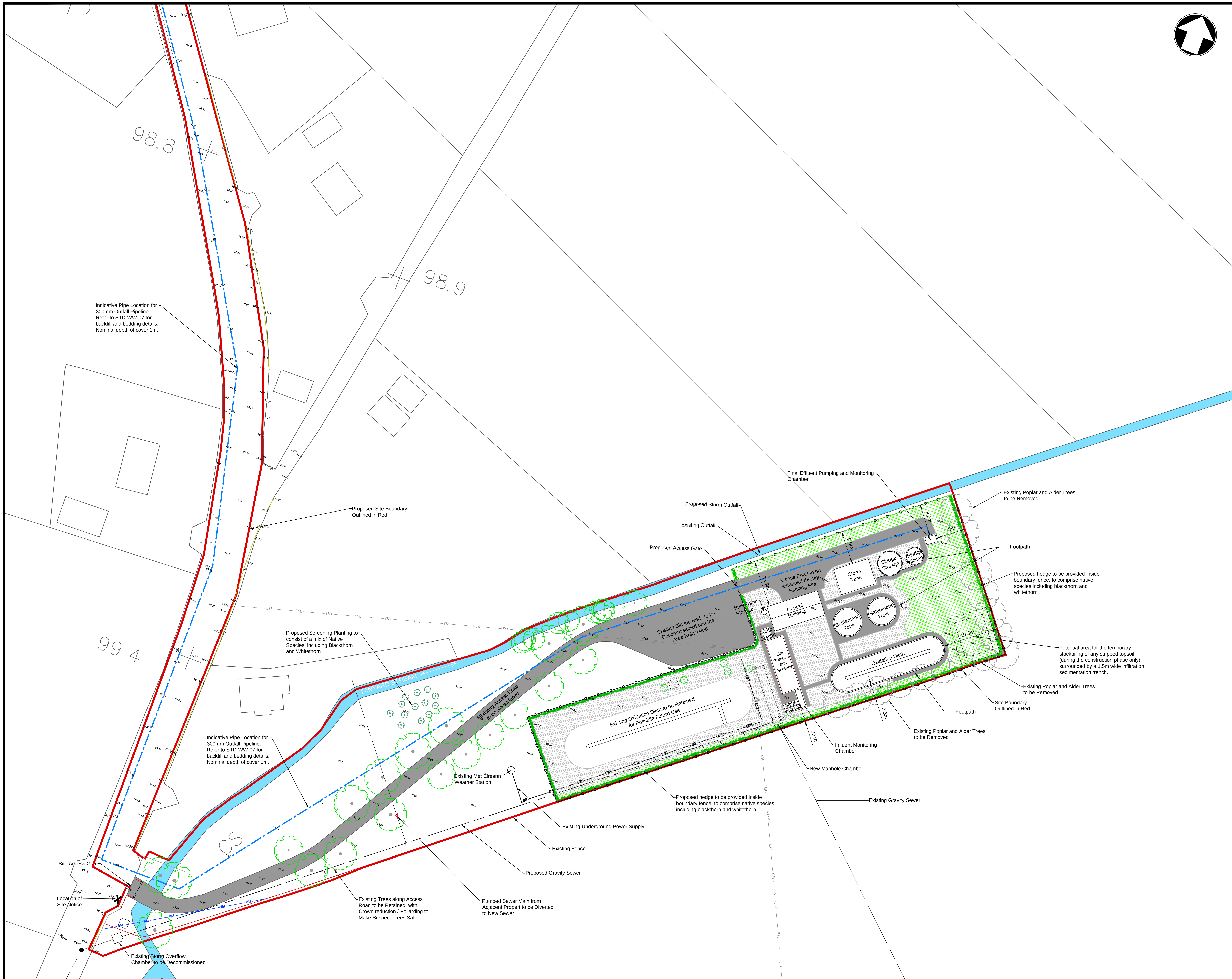
Sunnyside House, Macroom, Co. Cork, Ireland.

Help Protect Ireland's Inland Fisheries

Call 1890 34 73 24 to report illegal fishing, water pollution or invasive species.

Appendix B. Specimen Design Layout

Drawing Nr. MMD-330760-C-DR-00-XX-0113



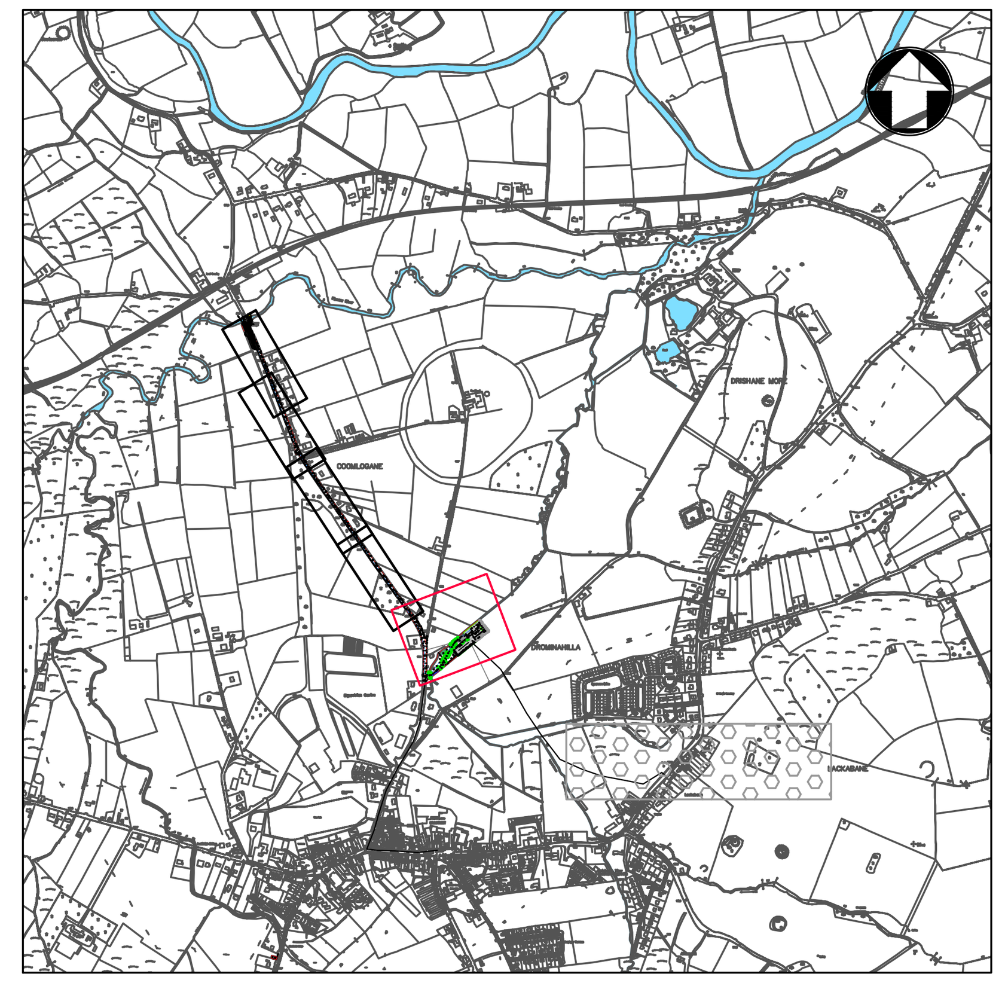
98.8
98.9
99.4
Indicative Pipe Location for 300mm Outfall Pipeline. Refer to STD-WW-07 for backfill and bedding details. Nominal depth of cover 1m.
Proposed Site Boundary Outlined in Red
Final Effluent Pumping and Monitoring Chamber
Proposed Storm Outfall
Existing Outfall
Proposed Access Gate
Existing Poplar and Alder Trees to be Removed
Footpath
Proposed hedge to be provided inside boundary fence, to comprise native species including blackthorn and whitethorn
Potential area for the temporary stockpiling of any stripped topsoil (during the construction phase only) surrounded by a 1.5m wide infiltration sedimentation trench.
Existing Poplar and Alder Trees to be Removed
Site Boundary Outlined in Red
Footpath
Existing Poplar and Alder Trees to be Removed
Influent Monitoring Chamber
New Manhole Chamber
Existing Gravity Sewer
Proposed hedge to be provided inside boundary fence, to comprise native species including blackthorn and whitethorn
Proposed Screening Planting to consist of a mix of Native Species, including Blackthorn and Whitethorn
Existing Sludge Beds to be Decommissioned and the Area Reinstated
Access Road to be extended through Existing Site
Control Building
Storm Tank
Sludge Storage
Sludge Thickener
Settlement Tank
Settlement Tank
Oxidation Ditch
Grit Removal and Screens
Pump Station
Existing Oxidation Ditch to be Retained for Possible Future Use
Existing Access Road to be Resurfaced
TANYARD STREAM
Existing Met Éireann Weather Station
Existing Underground Power Supply
Existing Fence
Proposed Gravity Sewer
Pumped Sewer Main from Adjacent Propert to be Diverted to New Sewer
Existing Trees along Access Road to be Retained, with Crown reduction / Pollarding to Make Suspect Trees Safe
Indicative Pipe Location for 300mm Outfall Pipeline. Refer to STD-WW-07 for backfill and bedding details. Nominal depth of cover 1m.
Site Access Gate
Location of Site Notice
Existing Storm Overflow Chamber to be Decommissioned
3.5m

Notes

1. Extract from OS Maps 6046-D & 6091-B
2. Townland: Drominahilla

Reproduced from the Ordnance Survey Ireland by Permission of the Government. Licence no. (B.G.E.) 3-3-34

Key to symbols



LOCATION PLAN SCALE 1:25000

Reference drawings

LEGEND

- Site Boundary / Pipeline Corridor
- Indicative Pipeline Location
- Gravel
- Grass
- Footpath
- Road

1:500 — 0, 25m, 50m

Rev	Date	Drawn	Description	Ch'k'd	App'd
P2	02.03.2017	NOBr	RE-ISSUED FOR PLANNING	FMcG	FMcG
P1	23.01.2017	NOBr	ISSUED FOR PLANNING	FMcG	FMcG

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Client
Irish Water
Colvill House
Talbot Street
Dublin 1

Title
Millstreet WWTP Upgrade
Planning Application
Site Layout Plan - Proposed
Sheet 1 of 3

Designed	-	Eng check	-
Drawn	N O'Brien	Coordination	-
Dwg check	F McGivern	Approved	F McGivern

Scale at A1	Status	Rev	Security
1:500	PRE	P2	STD

Drawing Number
MMD-330760-C-DR-00-XX-2011

Appendix C. Millstreet WWTP Ecological Surveys 2014 - 2016

Millstreet WwTP Upgrade

Ecological Survey

Version 21-10-14

Prepared on behalf of Mott MacDonald

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TABLE OF CONTENTS

1. INTRODUCTION

This report provides a description and evaluation of the flora, fauna and designated areas in the vicinity of the proposed Millstreet Waste water Treatment Plant (WwTP) Upgrade Project. The study area includes the existing WwTP and access road, the area of the proposed new outflow pipe, and the River Finnow in the vicinity of the proposed outflow pipe to the confluence of the River Blackwater. The study area is shown in Figure 1. This report has been prepared to inform the final design of the proposed upgrade and the route of the proposed outflow pipe.

This Tanyard Stream is a tributary of the River Fin now and is located to the north of the study area. This stream flows into the River Finnow. The River Finnow flows into the Blackwater River approximately 150m downstream of Wallis's Bridge. The River Finnow is within the Blackwater River (Cork/Waterford) cSAC. This report describes the terrestrial and aquatic ecological interests within the study area. The aim of the study is to identify features of ecological interest within the site that may present constraints to development or where special mitigation is necessary.

2. METHODOLOGY

2.2 Desktop Review

A desktop review was carried out to identify features of ecological importance in the study area. Sources used included the websites of the National Parks and Wildlife Service (www.npws.ie) and the National Biodiversity Data Centre (www.biodiversityireland.ie). A full list of sources is provided in the references section of this document. Special Areas of Conservation (SACs), Special Protection Areas (SPAs) and Proposed Natural Heritage Areas (pNHAs) in the vicinity of the development site were identified. The DoEHLG (2009) Freshwater Pearl Mussel Munster Blackwater Sub-Basin Draft Management Plan was also consulted.

2.3 Field Survey Work

Fieldwork was undertaken following NRA (2008) *'Ecological surveying techniques for protected flora and fauna during the planning of National Road Schemes'*, which is suitable for the current assessment.

2.3.1 Flora

A Phase 1 habitat survey of the site was undertaken during September 2014. Information was recorded at a level corresponding with the Heritage Council publication '*Best Practice Guidance for Habitat Surveying and Mapping*' (Smith *et al.,* 2011). Habitat mapping was aided by aerial photography and habitats recorded were classified according to Fossitt '*A Guide to Habitats in Ireland*' (2000).

2.3.2 Fauna

2.3.2.1 Mammals

Mammal surveys for protected species including badger and otter was undertaken in September and October 2014. The study area was walked and any signs of mammal activity were recorded. Otter surveys were undertaken following *'Monitoring the Otter Lutra lutra'* by Chanin (2003), with badger surveys following the methodology given in '*Surveying for badgers'* by Harris *et al* (1989).

A daylight visual assessment was also carried out in September 2014 to assess suitable bat roosting habitat in trees in the study area. Trees within the study area were visually examined from the ground for potential use by bats, and were rated on scale from 0-3 in terms of suitability for bats, based on the system devised by Billington and Norman (1997). Survey methods conformed to the manual *'Bat Mitigation Guidelines for Ireland'* by Kelleher & Marnell (2006).

A general bat activity survey was undertaken in October 2014, to investigate the usage of the study area by bats and identify which species of bats were present. The survey was undertaken by two ecologists using hand held bat detectors and involved walking the site from dusk to 2 hours after. Bat species using the site were identified both in real time and also from recordings made using an Anabat CF1.

2.3.2.2 Fish

The lower reaches of the Tanyard Stream and the River Finnow were assessed as part of the current appraisal. Aquatic habitat assessments in relation to fish and aquatic ecological interests were carried out using the methodology given in the Environment Agency's *'River Habitat Survey in Britain and Ireland Field Survey Guidance Manual'* (EA, 2003) and the Irish Heritage Council's *'A Guide to Habitats in Ireland'* (Fossitt, 2000). A snorkelling survey of the River Finnow was undertaken to inform the fish assessment. Watercourses were visually assessed with reference to lamprey habitat, in cognisance of the habitats used by adult and immature/juvenile/larval lampreys (ammocoetes), as in Maitland (2003).

2.3.2.3 Aquatic macroinvertebrates

The Tanyard Stream and the Finnow River were assessed in terms of habitat suitability for aquatic macroinvertebrates using a scheme developed by Barbour and Stribling (1991). This method assesses habitat parameters and rates each parameter as optimal, sub-optimal, marginal or poor (scores 5, 10, 15 and 20 respectively). The scores for each parameter are then added up to give an overall habitat score.

A Freshwater Pearl Mussel survey was carried out on the lower reach of the Tanyard Stream, the River Finnow (from 100m upstream of the Tanyard Stream confluence to the River Blackwater) and the Blackwater River (from 120m upstream of the Finnow confluence to 120m downstream of the Finnow confluence). This survey comprised a Stage 1 / 2 visual examination of the aforementioned stretches of watercourse. This survey was carried out following the NPWS guidance '*Margaritifera margaritifera Stage 1 and Stage 2 survey guidelines. Irish Wildlife Manuals, No. 12'* (Anon, 2004); and employed both wading/bathyscope survey and snorkelling survey. This survey included an assessment of the habitat condition using environmental parameters set out in the Fourth Schedule of the EC Environmental Objectives (Freshwater Pearl Mussel) Regulations (S.I. 296 of 2009). The FPM survey was carried out under licence from the Department of Arts, Heritage and the Gaeltach under Section 9, 23 and 34 of the Wildlife Acts (1976-2012) (Licence Number C114/2014).

2.3.2.4 Birds

The current survey was undertaken outside of the bird nesting season. However, the importance of the study area to birds was assessed with reference to the habitats present. A kingfisher habitat survey was undertaken along the watercourses with an emphases on identifying any historical nesting sites. The survey was undertaken with reference to the report by Cummins (2010).

2.3.2.5 Reptiles and amphibians

Reptiles and amphibians occurring within the proposed development site and surrounding study area were recorded during the course of the site walkover and mammal / fish investigations.

2.4 Consultations

Preparation of this section included consultation through publicly-available information, with:

- National Parks and Wildlife Service (NPWS);
- Inland Fisheries Ireland (IFI);
- Cork County Council;
- Botanical Society of the British Isles (BSBI);
- Birdwatch Ireland;
- Bat Conservation Ireland (BCI);
- Environmental Protection Agency (EPA);
- National Biodiversity Data Centre (NBDC).

2.5 Evaluation

Evaluations follow NRA (2008) 'Ecological surveying techniques for protected flora and fauna during the planning of National Road Schemes'.

3. RECEIVING ENVIRONMENT

3.1 Designated Areas

Designated sites of ecological and geological importance within 15km of the study area are considered, including candidate Special Areas of Conservation (cSAC) and Special Protection Areas (SPAs) designated within the Natura 2000 network; as well as Natural Heritage Areas (NHA's). These are discussed separately below.

3.1.1 Designated Natura 2000 sites

Enforcement of the protection of SPA's and SAC's in Ireland is provided by the transposition of the EU 'Habitats Directive' (92/43/EEC) into Irish law, as the EC (Birds and Natural Habitats) Regulations (2011). Figure 2 shows the Special Areas of Conservation and Special Protection Areas within 15km of the proposed development. Figure 2 presents the location of the study area and the locations of the designated Natura 2000 sites (SACs and SPAs) within 15km of the proposed development. The Natura 2000 sites within a 15km radius include:

- The River Blackwater cSAC;
- Killarney National Park, Macgillycuddy's Reek and Caragh River Catchment cSAC;
- Stacks to Mullaghareirk Mountain, West Limerick Hills and Eagle Mountains SPA;
- Mughanish Bog cSAC.

The only Natura site of concern in relation the proposed development is the River Blackwater cSAC.

3.1.1.1 The River Blackwater cSAC

The northern extent of the study area is located within the River Blackwater cSAC, where a portion of a field within the site occurs between the Finnow River and the Tanyard Stream, and a whole field adjacent and east of the Tanyard Stream is also part of this designated site. The proposed discharge from the Millstreet WwTP is to the River Finnow within this designated area.

The River Blackwater is one of the largest rivers in Ireland, draining a major part of Co. Cork and parts of Counties Kerry, Limerick, Tipperary and Waterford. The site consists of most of the freshwater stretches of the system as well as the estuarine component at Youghal. Tidal influence extends almost to Cappoquin. Main tributaries include the Rivers Lickey, Bride, Allow and Awbeg. A wide range of habitats associated with the rivers are included within the site, including substantial areas of woodland (deciduous, mixed), scrub, wet grassland, swamp and marsh vegetation, bog, salt marshes and intertidal sand and mud flats. Areas of improved grassland, arable land and coniferous plantations are included in the site for water quality reasons.

The site supports important examples of a range of Annex I habitats, notably estuaries, intertidal mudflats and sandflats, perennial vegetation of stony banks, salt meadows, floating river vegetation, alluvial forests, yew woodland and oak woodlands. Most of these are of good quality and extensive in area.

The Blackwater system is an important salmonid fishery and is of high conservation value for *Salmo salar* (Atlantic salmon). Also supports important populations of *Lampetra planeri* (Brook Lamprey) *L. Fluviatilis* (river lamprey), *Petromyzon marinus* (sea lamprey) and *Alosa fallax fallax* (twaite shad). Substantial populations of *Margaritifera margaritifera* (fresh water pearl mussel) occur, while *Austropotamobius pallipes* (Freshwater Crayfish) is found in the Awbeg River.

3.1.2 Natural Heritage Areas

Sites of national ecological importance in the Republic of Ireland are designated as Natural Heritage Areas (NHA's) or proposed Natural Heritage Areas (pNHAs). NHA and pNHA sites within a 15km radius of proposed development site are identified and are shown in Figure 2b. The NHA and pNHA sites within 15km of the proposed development are:

- Killarney National Park, Macgillycuddy's Reek and Caragh River Catchment pNHA (code 00365);
- Boggeragh Mountains (002447);
- Mughanish Bog pNHA (001890);
- Banteer Ponds pNHA (001036).

None of the above sites are affected by the proposed development.

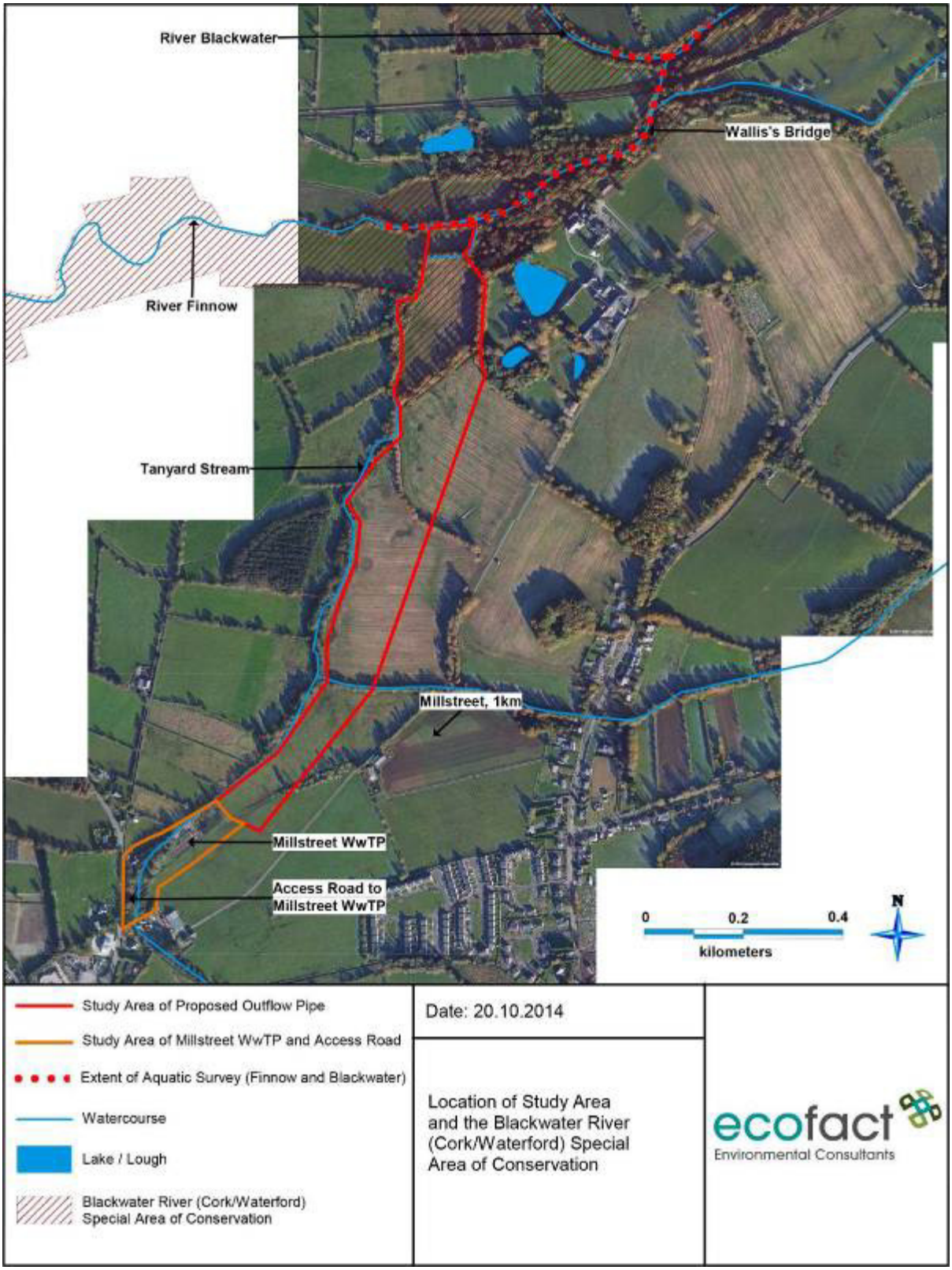

Figure 1 Site location map showing the boundary of the proposed development, Millstreet, Co. Cork.

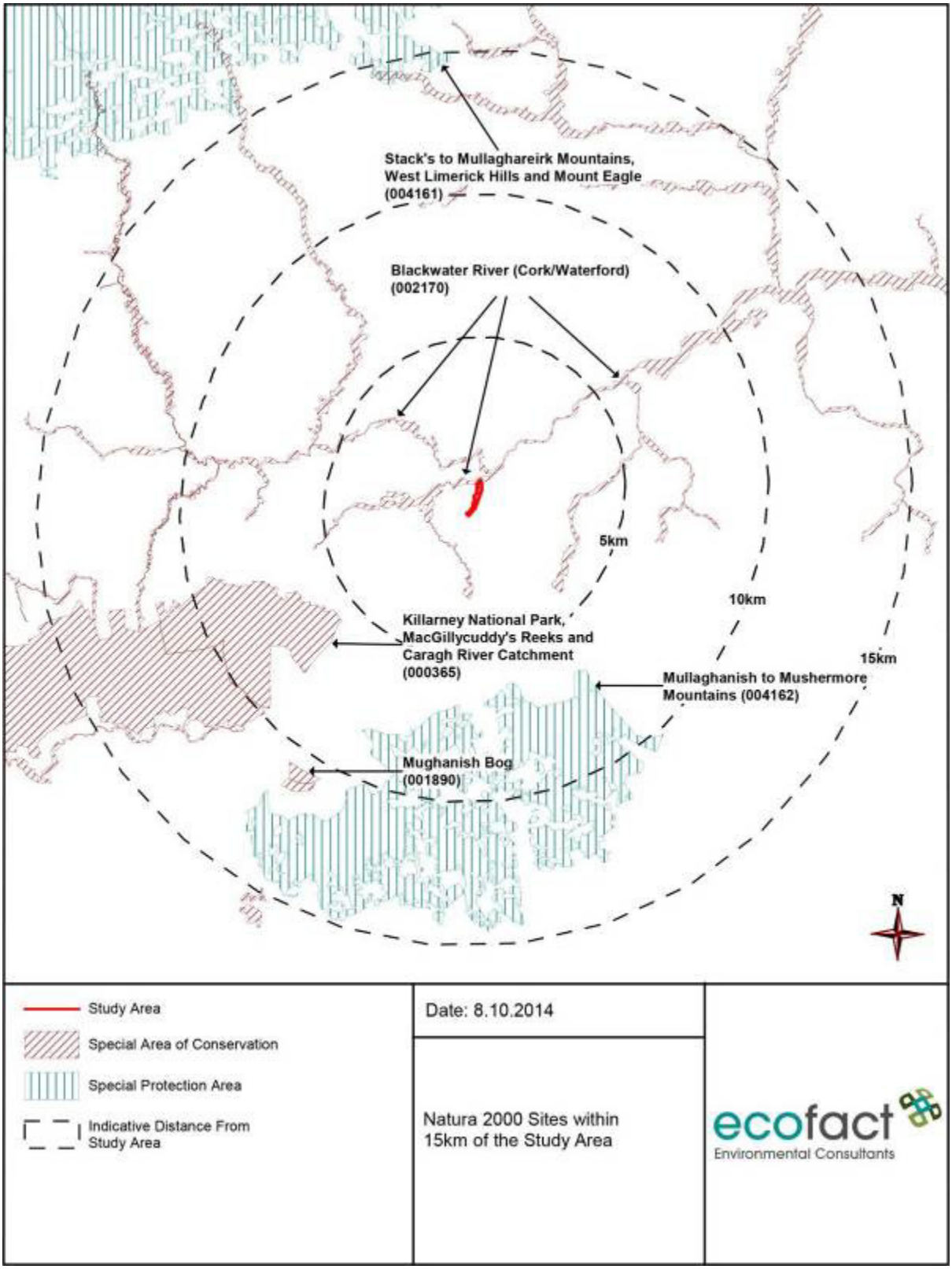

Figure 2a Special Areas of conservation and Special Protection Areas within 15km of the study area.

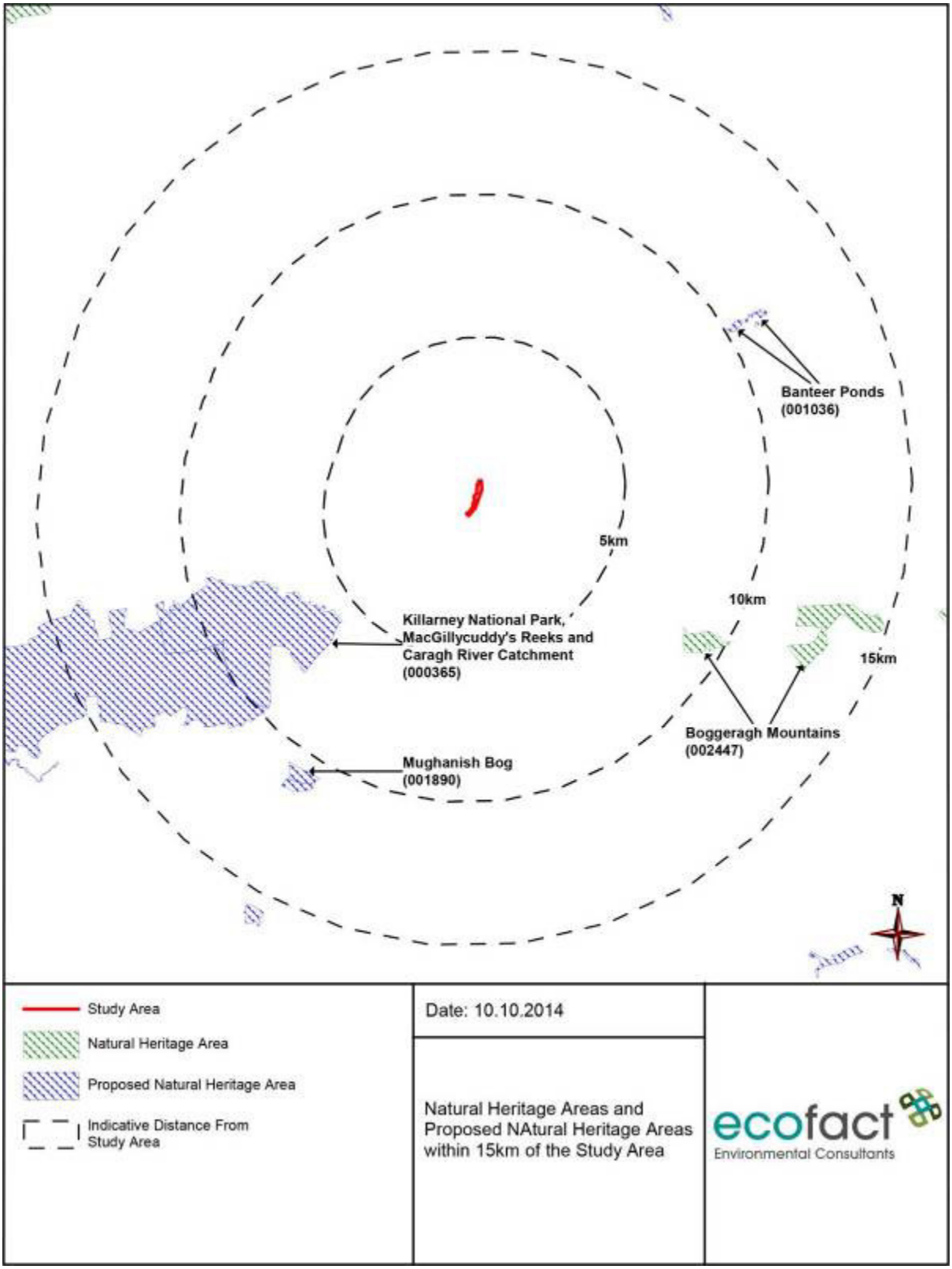

Figure 2b Natural Heritage Areas and proposed Natural Heritage Areas within 15km of the study area.

3.2 Flora

The different habitat types recorded from within the proposed development site are listed in Table 1 and described individually below. The habitat code according to Fossitt (2000) is in brackets after the habitat name. Habitat maps for the proposed development site are presented in Figures 3.1 and 3.2.

The proposed development site / study area is mostly in an area of agricultural grassland, the primary landuse in the region. Associated with the grassland habitats of the site are and hedgerows / treelines, which border many of the fields. The Tanyard Stream flows along the western boundary of the study area and occurs within the site at the northern extent. The River Finnow is present at the northern boundary of the study area.

The Tanyard Stream and the Finnow River are considered the most important habitats as these watercourses flow into / are within the River Blackwater cSAC. The habitats occurring within the proposed development site are common in the area and are not of significant ecological importance however. No rare or protected plant species were recorded. The habitats present within the study area are discussed in more detail below under habitat headings.

Table 1 List of the habitat types recorded from the proposed development site (according to Fossitt, 2000) with corresponding Annex I habitats identified.

Habitat Code	Habitat name
GA1	Improved agricultural grassland
WL2	Treelines
WD2	Mixed broadleaved
FW4	Drainage ditch
FW1	Eroding upland watercourses
FL8	Artificial lakes and ponds
ED2	Spoil and bare ground
ED3	Recolonising bare ground

3.2.1 Improved agricultural grassland (GA1)

Intensively managed/highly modified agricultural grasslands within the proposed development site are species-poor and correspond to the habitat 'improved agricultural grassland'. All fields within the study area have recently undergone intensive management and some fields have been recently reseeded. Sward quality in the study area is considered poor owing to low soil nutrients and naturally poor drainage. Most of the fields within the study area are bordered by drainage ditches.

Evaluation: This habitat is of local importance, low ecological value.

3.2.2 Treelines (WL2)

Treelines consisting of beech *Fagus sylvatica*, ash *Fraxinus excelsior*, oak *Quercus* sp., sycamore *Acer pseudoplatanus* and Scot's pine *Pinus sylvestris* (rare) and combinations of these occurs along field and watercourse boundaries within the study area. These treelines are well established with mature trees comprising the bulk of the treeline composition. Most treelines along field boundaries were planted as indicated by the equal age of these trees and single species composition (beech). There is little understorey vegetation associated with these treelines given the level of scrub clearance and high level management. Spoil and bare ground/recolonising bare ground habitat occurs beneath some treelines, owing to intensive management. Treelines along the Tanyard Stream and River Finnow are more diverse have an understorey of whitethorn *Crataegus monogyna* and considered to be semi-natural.

Evaluation: The treelines within the site are evaluated as being of local importance higher value with respect to wildlife connectivity and the cover they provide for mammals and birds.

3.2.3 Mixed broadleaved woodland (WD3)

There are a few small stands of mixed broadleaved woodland within the study area: two stands bordering the eastern component of the site and a strip of this woodland type near the southern end of the site. These stands comprise beech, ash, oak, sycamore, alder *Alnus glutinosa* and willow *Salix* sp.

Evaluation: This habitat is of local importance, lower value in respect of the poor botanical diversity within the habitat.

3.2.4 Drainage ditches (FW4)

Entirely artificial linear channels occur along most field boundaries. These correspond to the habitat 'drainage ditch'. Some of the drainage ditches have standing water and some were completely dried out. Most drainage ditches had been recently maintained and had poor floral diversity. This habitat is closely associated with spoil and bare ground/recolonising bare ground habitats.

Evaluation: The drainage ditches in the study area are of local importance, lower value.

3.2.5 Eroding upland watercourses (FW1)

This habitat category includes natural watercourses, or sections of these, that are actively eroding, unstable and where there is little or no deposition of fine sediment. The Tanyard Stream and the River Finnow are classified as eroding upland watercourses. These watercourses have stony substrates and are heavily shaded in places. More information on these watercourses can be found in the section on fish, where physical characteristics are described. A stand of water crowfoot *Ranunculus* sp. was recorded in the Finnow River approximately 100m downstream of the Tanyard stream confluence. This would not correspond to the Annex I habitat 'Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation' due to the small size of the stand present, and low species diversity.

Evaluation: The Tanyard Stream upstream of the Blackwater River cSAC is of local importance, higher value. Within the Blackwater River cSAC, Finnow River and Tanyard stream are evaluated as being internationally important.

3.2.6 Spoil and bare ground (ED2)

Within two fields comprising agricultural grassland habitat, there are pockets of crushed limestone in depressed (presumably excavated) areas. These areas have little vegetative cover and are assigned 'spoil and bare ground' habitats. These artificial areas were created as part of a horse riding course.

Evaluation: This habitat is of local importance, lower value.

3.2.7 Recolonising bare ground (ED3)

Recolonising bare ground habitat occurs beneath treelines, owing to intensive management.

Evaluation: This habitat is of local importance, lower value.

3.2.8 Amenity Grassland (GA1)

Managed areas of grass within the existing Millstreet WwTP grounds correspond to 'amenity grassland'.

Evaluation: This habitat is of local importance, lower value.

3.2.9 Buildings and artificial surfaces (BL3)

Buildings and artificial surfaces occur within the bounds of the Millstreet WwTP where concrete and bitumen occur. The access road to the Millstreet WwTP also corresponds to the habitat 'buildings and artificial surfaces'.

Evaluation: This habitat is of local importance, lower value.

3.2.10 Rare plant species

No protected flora was recorded from within the study area during the current survey. The proposed development site is within 10km grid square W29. No rare or protected plant species have been included in the NBDC database with respect to this area.

3.2.11 Non-native invasive flora

The non-native and invasive plant Japanese knotweed *Fallopia japonica* was recorded at Wallis's Bridge approximately 400m downstream of the River Finnow-Tanyard Stream confluence. No other non-native plants were recorded during the current study.

3.3 Fauna

3.3.1 Mammals

3.3.1.1 Non-volant mammals

A walkover study of the study area confirmed that the study area is of no particular importance to non-volant mammals.

The hard clayey nature of the soil in the study area does not suit the burrowing requirements of many mammal species such as badger *Meles meles.* Reseeding of fields, drainage maintenance, and clearance of vegetation between field boundaries within the study area has occurred recently and within the past few years. These activities are considered to have significantly affected cover for ground dwelling mammals, reducing the value of the site for a range of mammals including badger, rabbit *Oryctolagus cuniculus*, stoat *Mustela arminea* and hare *Lepus timidus hibernicus*.

There was no evidence of badger activity (foraging) or badger setts within the site. Disused rabbit burrows were recorded beneath a treeline at NOS 27837 91707. Footprints deemed to be those of a mink *Mustela vison* were recorded along the Tanyard Stream. This species is non-native, predates on and threatens other native wildlife.

Stands of mature woodland that occur adjacent to the study area may be used by badger and other non-volant mammals such as Pine marten *Martes martes*, hedgehog *Erinaceus europaeus* and pygmy shrew *Sorex minutus.* Evidence of otter *Lutra lutra* in the form of a spraint (dropping) was recorded near the confluence of the River Finnow and the Tanyard Stream. It is likely that the River

Finnow corridor which forms part of the northern boundary of the study area is frequently used by otter for foraging as this river is considered a good source of fish for otter. No holts (otter dwellings) were recorded along the River Finnow from 100m upstream of the Tanyard Stream confluence to the River Blackwater confluence.

Evaluation: The study area is generally poor with regard to feeding and dwellings for non-volant mammals, owing to intensive management. Overall, the study area is rated as being of local importance, low ecological value. The watercourses within and adjoining the study area are likely to be used by non-volant mammals in the locality as a drinking source and are rated as being of local importance, high ecological value.

3.3.1.2 Bats

Existing bat records show that Common pipistrelle *Pipistrellus pipistrellus,* Soprano pipistrelle *Pipistrellus pygmaeus,* Nathusius' pipistrelle *Pipistrellus nathusii,* Leisler's bat *Nyctalus leisleri*, Daubenton's bat *Myotis daubentoni* have been recorded in the 10km grid square W29 which covers the study area (NBDC, BCI & NPWS).

The National Biodiversity Data Centre (NBDC) maps landscape suitability bats based on Lundy *et al* (2011). The maps are a visualisation of the results of the analyses based on a 'habitat suitability' index. The index ranges from 0 to 100 with 0 being least favourable and 100 most favourable for bats. Table 2 gives the suitability of the study area for the bat species found in Ireland (based on NBDC) along with their Irish Red List Status (from Marnell *et al,* 2009). It can be seen that the study area is generally suboptimal as regards suitability for bats with the suitability index for all bats at just over 26.

Table 2 Suitability of the study area for the bat species found in Ireland (based on the NBDC data). Irish Red list status also indicated (based on Marnell *et al,* 2009).

Common name	Scientific name	Suitability index	Irish red list status
All bats	-	26.33	N/a
Common pipistrelle	*Pipistrellus pipistrellus*	39	Least Concern
Soprano pipistrelle	*Pipistrellus pygmaeus*	38	Least Concern
Nathusius' pipistrelle	*Pipistrellus nathusii*	1	Least Concern
Lesser horseshoe bat	*Rhinolophus hipposideros*	10	Least Concern
Daubenton's bat	*Myotis daubentonii*	25	Least Concern
Brown long-eared bat	*Plecotus auritus*	40	Least Concern
Leisler's bat	*Nyctalus leisleri*	35	Near Threatened
Natterer's bat	*Myotis nattererii*	29	Least Concern
Whiskered bat	*Myotis mystacinus*	20	Least Concern

Treelines containing mature trees occur along field boundaries within and adjacent to the study area. Treelines are generally maintained and these trees have little/no ivy as this has been removed from trees, decreasing their value as potential bat roosts. No crevices, cracks or spaces beneath bark were found in any trees in the study area that were definitely confirmed as being used by bats. However, there were a number of trees in the study which had at least some potential for being used by bats and these are listed and evaluated in Table 3. Trees in woodland adjoining the study area were regarded as providing more opportunities in terms of bat roost habitats i.e. larger trees with cavities occurring in more sheltered conditions. Treelines within and adjacent to the study area are considered to provide linkage to other bat habitats and may be used to some degree by foraging bats.

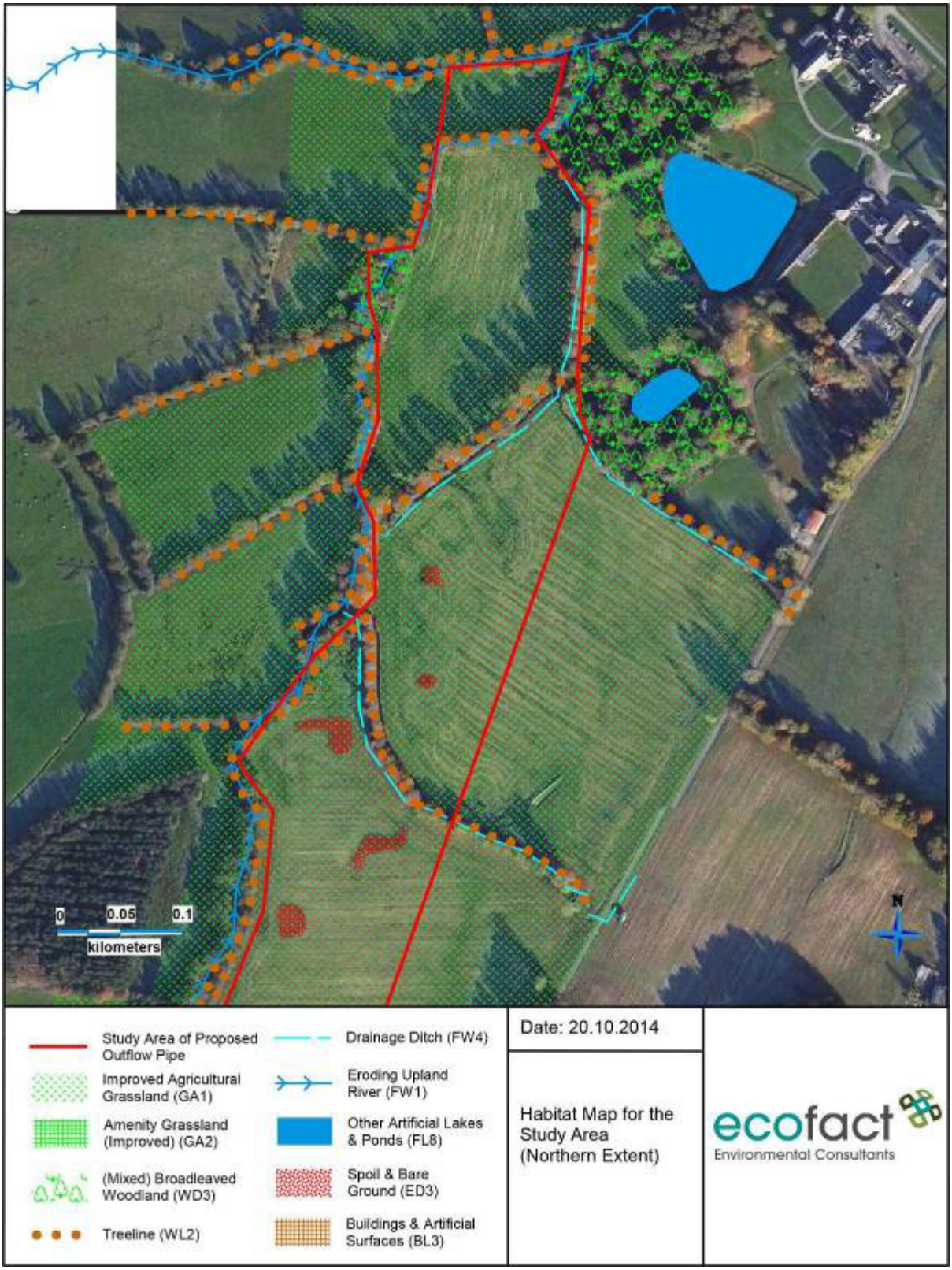

Figure 3.1 Habitat map showing the northern extent of the proposed development site.

Figure 3.2 Habitat map showing the southern extent of the proposed development site.

There are no buildings in the study area which are used by bats. The only structure of any potential use to roosting bats was a bridge over a drain to the east of the study area. This bridge was constructed of a series of flagstones placed on stone walls. The underside of this bridge was checked for the presence and evidence of past bat usage but no evidence of same was found. Numerous buildings around the proposed development area were deemed suitable for bat roosting, in particular farm houses and associated outbuildings.

A bat activity survey was undertaken during early October and three species of bat were recorded; Common Pipistrelle, Soprano pipistrelle, and Daubenton's bat. High levels of pipistrelle activity (both species) was recorded in the area of the access road to the existing waste water treatment plant. This was found to the most important area for bat activity in the study area. Occasional individual Common and Soprano pipistrelle bats were recorded in the study area of the proposed outfall pipe. Bat activity in this area was associated with tree lines and hedgerows. Low levels of Soprano pipstrelle activity were also recorded along the Finnow River corridor, and a single *Myotis* sp. bat, thought to be a Daubenton's bat was picked up briefly by the Anabat detector while in this area.

Table 3 Trees in the study area which were identified as having some suitability for use by bats.

Tree Species	Age	Refuge Type	Co-ordinates	Bat Suitability Index **
Popular *Populus Sp.*	Semi-mature	Ivy	W 27365 90989	2
Popular *Populus Sp.*	Mature	Ivy	W27348 90951	2
Popular *Populus Sp.*	Mature	Ivy	W27343 90945	2
Popular *Populus Sp.*	Mature	Ivy	W 27330 90927	2
Popular *Populus Sp.*	Semi-mature	Ivy	W 27324 90900	2
Alder *Alnus glutinosa*	Semi-mature	Ivy	W 27293 90880	1
Beech *Fagus sylvatica*	Mature, Stunted	Tree Hollow	W 27885 91609	2
Beech *Fagus sylvatica*	Mature, Stunted	Tree Hollow	W 27834 91652	2
Beech *Fagus sylvatica*	Mature, Stunted	Tree Hollow	W 27830 91662	1
Beech *Fagus sylvatica*	Veteran	Tree Hollow	W 27827 91674	1
Beech *Fagus sylvatica*	Veteran	Tree Hollow	W 27813 91750	1
Beech *Fagus sylvatica*	Mature	Tree Hollow	W 27824 91812	1
Beech *Fagus sylvatica*	Mature	Tree Hollow	W 27834 91788	1
Beech *Fagus sylvatica*	Mature	Tear Hole	W 27837 91823	1
Oak *Quercus robur*	Semi-mature	Ivy	W 27862 91861	1
Alder *Alnus glutinosa*	Semi-mature	Ivy	W 27683 91295	2
Beech *Fagus sylvatica*	Mature	Ivy	W 27915 91897	2
Oak *Quercus robur*	Mature	Ivy	W 37859 91860	2
Beech *Fagus sylvatica*	Mature	Tree Hollow	W 27994 92009	1
Beech *Fagus sylvatica*	Mature	Tree Hollow	W 27994 92029	1
Beech *Fagus sylvatica*	Mature	Tree Hollow	W 27995 92050	2
Beech *Fagus sylvatica*	Mature	Tree Hollow & Ivy	W 28006 92088	1
Beech *Fagus sylvatica*	Mature	Tree Hollow & Ivy	W 27993 92098	1
Ash *Fraxinus excelsior*	Mature	Ivy	W 27935 92135	1

**Bat Suitability Index:
0=No potential (no suitable refuge)
1=Refuges present, may be of use to bats.
2=Refuges ideal for bats but no evidence of usage
3=Evidence of bat usage.

It is noted that the bat activity survey was undertaken near the end of the bat activity season and was only undertaken over one night. Conditions for the survey were also suboptimal, and this may have reduced bat activity levels along the River Finnow now corridor. It is also likely that summer levels of bat activity along the Finnow River would be high, and it is likely that Daubenton's bat and Soprano Pipistrelle bat would use this river corridor. However, downstream areas, such as pools in the Blackwater River are considered to be potentially more important with respect to Daubenton's bat foraging.

Evaluation: The study area is considered suboptimal in light of bat foraging, commuting and roosting. No definite roosts were identified; however the trees listed in Table 3 should all be considered as being potential minor bat roosts. The access road to the existing WwTP and the Finnow River corridor are the most important areas for bats. The bat habitats are evaluated as being of Local importance, Higher Value.

3.3.2 Fish

The River Finnow and Tanyard Stream occur in the study area, and these are sub-catchments of the River Blackwater (Munster). The River Blackwater (EPA code 18B02) rises in east Co. Kerry approximately 6.5 km northwest of Ballydesmond. The river flows east for approximately 170 km through the counties of Cork and Waterford flowing through Ballydesmond, Banteer, Mallow before entering the sea at Youghal. Its entire catchment is in the region of 3,100km^2. It drains five ranges of mountains, and in times of heavy rainfall can fluctuate by more than four meters. The peaty nature of the terrain in the upper reaches and some of the tributaries gives the water a dark colour, hence the river's name. The River Blackwater is a designated Salmonid water under S.I. No. 293/1988 — European Communities (Quality of Salmonid Waters) Regulations, 1988. It is also considered to be a nationally important watercourse for salmon and sea trout.

The River Finnow rises on the eastern slopes of the Derrynasaggart Mountains to the southwest of Millstreet. The River Finnow flows to the west of Millstreet and flows in to the River Blackwater from the south approximately 2.5km north east of Millstreet. The Tanyard Stream rises approximately 3km south east of Millstreet. It generally flows in a northerly direction and meets the River Finnow as a 3rd order approximately 600m upstream of the River Blackwater River.

The fisheries value of the watercourses draining the proposed development area is related to stream size, physical characteristics and water quality. Table 4 gives the physical characteristics of the Tanyard Stream and the River Finnow. The salmonid habitat rating of these watercourses is summarised in Table 5.

The Tanyard Stream is considered limited with respect to fish production due to its small size. This lower reaches of stream have been modified in the past, with evidence of drainage along the stretch within the study area. The lower reaches of the stream, including the reach within / bordering the study area is likely to be used to some degree by spawning trout and perhaps even salmon. This stream is deemed suboptimal however with respect to all life stages of salmonids taking into account its average depth.

The Finnow River is a significant tributary of the River Blackwater and is considered to be a very important spawning and nursery area for both trout and salmon. It is clear that a significant population of brook lamprey also occurs.

During the current survey, there was evidence of instream works in the river upstream of the Tanyard Stream confluence, where boulders and rocks had been moved from the river to the sides of the channel. The River Finnow upstream and downstream of the recent instream works is characterised by a series of riffle-glide-pool sequences which offer refuge and cover for young salmonids. Floating river vegetation, rock and cobble substrates, instream branches and overhanging trees/scrub all increase the value of this part of the river for rearing fish. Gravels at the downstream end of pools are considered optimal spawning areas for salmonids. The generally medium-high gradient nature of the subject stretch of the River Finnow is best suited to the early life stages of salmonids. There were few pools deep enough along the surveyed stretch for holding adult salmon at the time of the survey, the maximum depth recorded being ca. 1.5m.

The River Finnow within the area affected by the instream works was seriously degraded with respect to salmonid habitat. The river had been widened and the bed had been levelled and was shallower and lacked of physical complexity as a result. The river within the area affected by the instream works and downstream areas was also covered with a layer of silt, further decreasing the value with regard to fish habitats. Filamentous algae *Cladophora* sp. was recorded in the Tanyard Stream and in the River Finnow and its growth was considered luxuriant, completely covering the substrate in some areas. This signifies unsatisfactory water quality with negative consequences for macroinvertebrates (fish food) and therefore reduces the habitat value of the subject watercourses for fish. No suitable habitat for juvenile lampreys was recorded in the Tanyard Stream or the Finnow River i.e. soft deposited substrates into which lampreys can burrow. However, brook lamprey spawning activity was recorded here previously by Ross (2009). It is noted that a recently installed dam on the Tanyard stream would severely restrict movements of brook lampreys and other species in this watercourse.
During the snorkelling survey of the River Finnow, some pools were found to hold adult trout. Of particular importance for adult fish were shaded pools with large instream debris such as fallen trees. As would be expected, the Finnow River was found to support a good population of juvenile salmonids. Young trout and salmon ranging from 0+ to 3+ were recorded mostly in riffled areas. Juvenile salmon were considered to outnumber juvenile trout 2:1. Minnow was also recorded during the snorkelling survey.

Table 4 Physical characteristics of the Tanyard Stream and the River Finnow.

Parameter	Tanyard Stream	River Finnow upstream of Tanyard Stream confluence	River Finnow downstream of Tanyard Stream confluence and upstream of instream works area	River Finnow downstream of instream works area
Wetted width (m)	1.5	4.5	5	5.5
Bank height (cm)	0.6	0.8	0.6	0.9
Bank cover (%)	50	45	50	30
Bank slope (degrees)	80	75	80	70
Canopy cover (%)	70	85	75	70
Flow (cm/s)	5	10	10	10
Riffle (%)	15	25	20	15
Glide (%)	15	30	25	30
Pool (%)	70	45	55	65
Mean depth (cm)	10	20	25	25
Maximum depth (cm)	30	1.5	1.4	1.6
Rock (%)	5	30	20	5
Cobble (%)	25	30	45	25
Gravel (%)	60	30	20	5
Fine (%)	10	10	15	70
In-stream vegetation (%)	0	0	5	5

Table 5 Habitat rating of the watercourses in the study area (Following DCAL's advisory leaflet "*The Evaluation of habitat for Salmon and Trout*"). Grade 1 is optimal habitat and habitat quality reduces towards Grade 4 (poor).

Habitat grades and approximate % fluvial cover	Tanyard Stream	River Finnow upstream of Tanyard Stream confluence	River Finnow upstream of instream works area	River Finnow within the instream works area
Spawning	2-3	3-4	4	4
%	5	15	15	10
Nursery	3	3	3-4	4
%	30	50	45	50
Rearing	3	3	3-4	4
%	50	30	40	30

3.3.6 Invertebrates

3.3.6.1 Aquatic macroinvertebrates

The physical habitat assessment of the Tanyard Stream and the River Finnow with respect to their suitability for macroinvertebrate production is presented in Table 6. The habitat of the Tanyard Stream within the study area is rated as being marginal-suboptimal for macro-invertebrate production with generally marginal pool quality, habitat complexity and bottom substrate.

The River Finnow upstream of the instream works has optimal bottom substrate and habitat complexity but overall was rated suboptimal for macroinvertebrate production with considerations for suboptimal canopy cover and bank features. The stretch of the River Finnow within the area where instream works were carried out was rated as 'poor'.

Table 6 Physical habitat assessment of the sites for their suitability for macroinvertebrate production, following the method given in Barbour and Stribling (1991).

	Tanyard Stream	River Finnow upstream of Tanyard Stream confluence	River Finnow upstream of instream works area	River Finnow within the instream works area
Bottom substrate	10	20	15	5
Habitat complexity	10	20	20	5
Pool quality	10	15	10	5
Bank stability	15	15	15	5
Bank protection	15	15	15	5
Canopy	15	15	15	10
Score	75	100	90	35
Overall Assessment	**Marginal-suboptimal**	**Suboptimal**	**Suboptimal**	**Poor**

3.3.6.1.1 Freshwater Pearl mussel

The Freshwater Pearl Mussel (FPM) *Margaritifera margaritifera* is listed under Annex II and V of the Habitats Directive (92:43:EEC). It is legally protected in Ireland under Statutory Instruments No. 112, 1990 and No. 94, 1999 and the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The species is also protected under the Convention on the Conservation of European Wildlife and Natural Habitats. It is listed as 'Endangered' on the International Union for Conservation of Nature and Natural Resources (IUCN) Red Data List. It is also protected under the Wildlife Act 1976 and Wildlife Amendment Act 2000.

The freshwater pearl mussel is a bivalve, which is a type of mollusc or snail with a body that is almost completely enclosed between a pair of shells. For most of its life, it is a filter feeder, and large quantities of water are pumped through the animal's siphons and food particles are trapped and passed to the mussel's mouth. The adult pearl mussel burrows to two-thirds of its shell depth, and is almost sessile in nature, often not moving for 100 years. The freshwater pearl mussel *Margaritifera margaritifera* has attracted a lot of interest in recent years due to its interesting ecology, life cycle, ability to produce pearls and, most importantly, its decline, which has left the species in danger of extinction.
The freshwater pearl mussel requires very high quality rivers with clean river beds and waters with very low levels of nutrients. In general, rivers and river bed habitat needs to be at "reference" level, i.e. near natural conditions are required. Where river water quality has been depressed by inputs such as phosphates and nitrates, elevated BOD, or dangerous substances, such as metals or insecticides (particularly sheep dip), mussel numbers can rapidly decline. The decline of freshwater pearl mussel populations in Ireland has mostly occurred from the continuous failure to produce new generations of

mussels because of the loss of clean gravel beds, which have become infiltrated by fine sediment and/or over-grown by algae or macrophytes.

Freshwater pearl mussels are widespread in Ireland, particularly in the South West, West and North West of the country. Populations range from very small relict examples with a few remaining elderly mussels that have not successfully recruited for 50 years, to some of the largest populations of pearl mussels in the world. There are 96 populations of pearl mussels in the Republic of Ireland, some of which include two or more rivers in close enough proximity to make them one single population (Moorkens et al. 2007). A total of 27 populations have been designated within 19 SAC areas for *Margaritifera margaritifera*.

The Munster Blackwater catchment is the largest freshwater pearl mussel catchment in Ireland. The population is at unfavourable Conservation Status in the Munster Blackwater. It is currently ranked as 24th out of the 27 Freshwater Pearl Mussel SAC populations in the country based on population status, habitat condition and current pressures. Recent declines have been due to a number of issues, which have combined to lower the quality of the river water and riverbed habitat. The purpose of the Blackwater River sub-basin management plan is to address the catchment-wide issues that are contributing to this decline and to develop a strategy for implementing measures that will bring the catchment and thus the population back to favourable condition (DEHLG, 2010a). The main causes of the current unfavourable conservation status of the Munster Blackwater freshwater pearl mussel population are agriculture, forestry, point source pollution, quarries, water abstraction, and physical modifications. The key improvements needed for the Munster Blackwater Catchment is to restore juvenile habitats to appropriate condition by simultaneously reducing nutrient and silt inputs to the river.

The survey for FPM in the study area was carried out the 12th September 2014 during low flows and bright conditions, ideal for a survey of this type. Table 7 gives the habitat condition of the Tanyard Stream, the River Finnow and the River Blackwater upstream and downstream of the River Finnow confluence for FPM.

Freshwater Pearl Mussel (FPM) was not recorded in the Tanyard Stream - this watercourse is deemed unsuitable for FPM taking into account its small size depth. FPM was not recorded in the surveyed stretch of the River Finnow i.e. from 100m upstream of the Tanyard Stream confluence to the River Blackwater after the river had cleared following instream works. A large proportion of the River Finnow within the study area had been adversely affected by river works however, causing deposition of silt on the bed of the river. The presence of a thick layer of silt may have made FPM invisible in the affected surveyed part of the River Finnow.

At the outset of the survey, the River Finnow was seen to be discoloured brown/yellow at Wallis's Bridge. Visibility in the water was no more than 10cm, indicating that the river was carrying a very large suspended solids load, despite no rainfall in the preceding hours. It was found that a stretch of approximately 80m of the River Finnow had been recently excavated a distance of approximately 200m upstream of Wallis's Bridge. At the upper extent of the works area, the right bank had been re-graded using stones from the river. Some of the bank on the left side of the channel had also been altered. The affected stretch of the River Finnow had been widened and the substrate within the affected stretch and downstream areas was covered in a layer of silt. A significant layer of silt had been deposited on the riverbed from the works area to the River Blackwater, the Blackwater confluence approximately 350m downstream of the works area. The substrate in the Blackwater River had a significant layer of freshly deposited silt which most likely originated from the instream works in the Finnow River. It is noted that the bed of the River Blackwater upstream of the River Finnow

confluence was lightly/moderately silted but the substratum in the River Blackwater downstream of the confluence was considered heavily silted.

Adult FPM were recorded in the River Blackwater upstream of the River Finnow confluence. These mussels were recorded from approximately 50m upstream of the Finnow confluence to the upper extent of the survey on the Blackwater i.e. 120m upstream of the River Finnow confluence. The bulk of these mussels were embedded into rock/cobble substrate within 5m of the right bank of the river. Only a single mussel was recorded in the surveyed stretch of the River Blackwater downstream of the River Finnow confluence. The substrate in the Blackwater River downstream of the River Finnow confluence had a significant layer of freshly deposited silt which most likely originated from the instream works in the Finnow River. Again, the presence of additional mussels in the River Blackwater downstream of the River Finnow confluence would have been difficult to detect given the coat of silt on the substrate.

3.3.6.2 Terrestrial macroinvertebrates

Taking into account the bland and intensively managed nature of the study area, terrestrial macroinvertebrate communities are considered to be limited to opportunistic, transient and common species. There are no habitats of particular importance for terrestrial macroinvertebrates in the study area.

Table 7 Habitat condition of the Tanyard Stream and the River Finnow for FPM.

	Tanyard Stream	River Finnow upstream of Tanyard Stream confluence	River Finnow upstream of instream works area	River Finnow within the instream works area	River Blackwater to 120m upstream of the River Finnow confluence	River Blackwater to 100m downstream of the River Finnow confluence
Population densities	Absent	Absent	Absent	Absent	Frequent to common	Occasional
Filamentous algae	Frequent	Frequent	Abundant	Rare	Frequent	Abundant
Macrophyte cover	None	None	None	None	None	None
Siltation	a lot of visible silt	Some visible silt	a lot of visible silt	a lot of visible silt	a lot of visible silt	a lot of visible silt
Overall assessment	Unsuitable	Suboptimal	Marginal	Habitat obliterated	Suboptimal	Poor

3.3.4 Birds

The current survey was undertaken outside of the breeding bird season; however it is clear that terrestrial habitats in the study area are not of significant importance to birds as they are heavily managed. The treelines and hedgerows in the study area are all likely to be used by bird species in common in the general area. The river corridor of the Finnow and Tanyard streams were checked for potential kingfisher nest sites and none were found. This species was also not recorded during the river corridor surveys. There are some banks approximately 80m downstream of the study area, but these were deemed to be too low to used by kingfisher for nesting (i.e. liable to flooding). There was also no evidence of historical nesting here. No kingfishers were seen during the current survey. Two dippers were recorded during the survey of the Finnow River.

3.3.5 Reptiles and Amphibians

No reptiles or amphibians were recorded during the survey and there are no optimal breeding habitats for these species in the study area. However, it is possible that the ponds in the study area are used by frogs by breeding. It is noted that these are artificial waterbodies

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PLATES

Plate 1 The existing Millstreet Sewage Treatment Plant.

Plate 2 The existing access road to the Millstreet Sewage Treatment Plant.

Plate 3 Improved agricultural grassland in the area of the proposed outfall pipe.

Plate 4 Drainage ditch habitat occurs along some of the field boundaries of the study area.

Plate 5 A strip of (Mixed) Broadleaved woodland occurs at the southern extent of the study area of the proposed outfall pipe.

Plate 6 Treelines occur along field boundaries and are dominated by beech.

Plate 7 An ivy covered tree which is likely to be used by bats; this was one of the best examples found on the site. It was adjacent to the Treatment Plant access road.

Plate 8 Some of the trees on the site had cracks and crevices like this that may be used by bats. This tree was located at W27885 91609. However, no definite usage of any tree by bats was identified.

Plate 9 Large mature broadleaf woodland and treelines exist within and around the site, these provide excellent foraging and commuting lines for bats.

Plate 10 Old rabbit burrows in an earth bank separating fields (NOS 27837 91707). No other mammal dwellings were recorded.

Plate 11 A suspected otter spraint found at the Tanyard-Finnow confluence.

Plate 12 Footprints deemed to be those of a mink *Mustela vison* were recorded along the Tanyard Stream.

Plate 13 Underside of a bridge was checked for the presence and evidence of past bat usage but this structure was found not to be used by bats.

Plate 14 Japanese Knotweed was recorded in the vicinity of Wallis's Bridge.

Plate 15 'Spoil and bare ground' habitat occurs within fields in the study area. Crushed limestone has been spread over an area deemed to have been excavated.

Plate 16 An artificially constructed lake within the study area at W27679 91211. Two grey herons were using this pond.

Plate 17 A dam / impoundment recently installed into the Tanyard stream.

Plate 18 Water is being abstracted from the Tanyard Stream to feed an artificially constructed lake.

Plate 19 The outfall form the artificially constructed lake was flowing back into the Tanyard stream.

Plate 20 A pump is being used to abstract water from the Tanyard stream.

Plate 21 Surveying for FPM in the River Blackwater upstream of the River Finnow confluence.

Plate 22 Snorkelling survey being carried out in the River Finnow. Underwater observation of the substrate, FPM detection and fish assemblages were recorded with this methodology.

Plate 23 Water crowfoot *Ranunculus* sp. was recorded in the River Finnow downstream of the Tanyard Stream confluence.

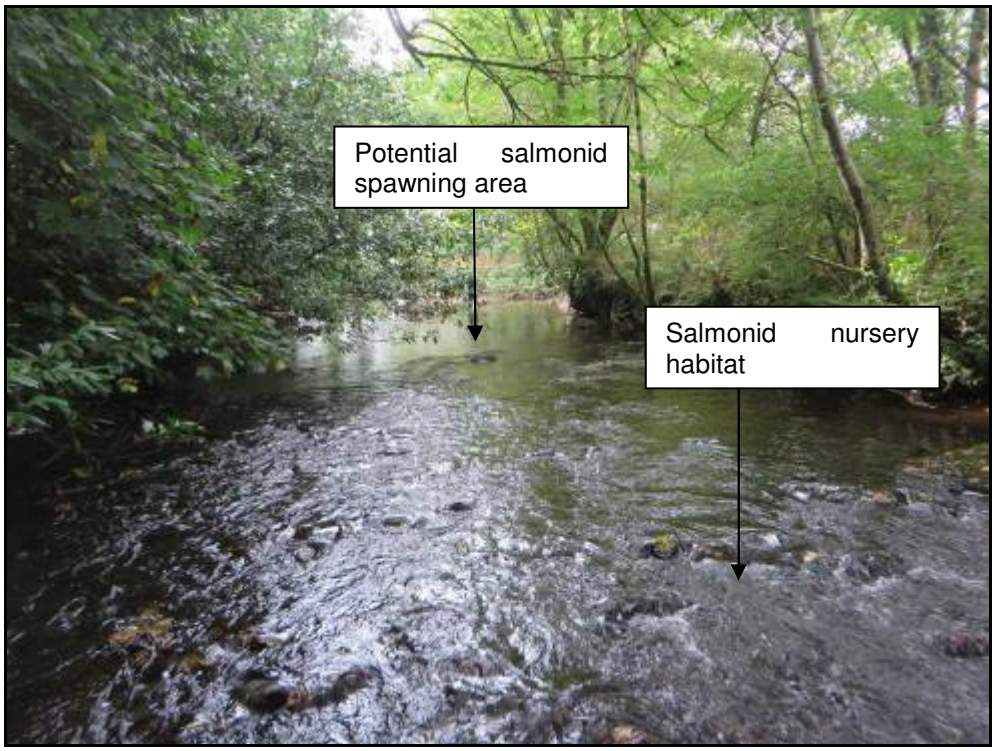

Plate 24 Riffled part of the River Finnow downstream of the Tanyard Stream confluence. Riffles and stony substrates provide cover for young salmonids. Cobble/gravel substrate at the end of pools provide suitable salmonid spawning habitat.

Plate 25 The Tanyard Stream is a 3rd order watercourse that flows into the River Finnow.

Plate 26 Confluence of the Tanyard Stream and the River Finnow.

Plate 27 River Finnow approximately 100m upstream of Wallis's Bridge. The source of suspended solids pollution was not yet established at this stage and works were considered to have been ongoing or recently carried out.

Plate 28 Stretch of the River Finnow downstream of Wallis's Bridge. This part of the river is approximately 100m from the River Blackwater and is within the Blackwater River (Cork/Waterford) cSAC.

Plate 29 River Finnow approximately 200m upstream of Wallis's Bridge. This part of the river has been excavated and at the upper extent of the works area, the right bank has been re-graded using stones from the river.

Plate 30 The stretch of the River Finnow affected by instream works has been widened and the substrate was found to be covered in a layer of silt during the current assessment.

Plate 31 Close up view of the substrate in the River Finnow within the stretch affected by instream works.

Plate 32 Upper limit of the instream works was obvious from the change in substrate conditions.

Plate 33 River Finnow downstream of the instream works area after the water had cleared. A significant layer of silt had been deposited on the riverbed from the works area to the River Blackwater.

Plate 34 Substrate in River Finnow downstream of the works area after the river had cleared. Silt was deeply embedded into the substratum and also coated instream vegetation.

Plate 35 Confluence of the River Finnow approximately 150m downstream of Wallis's Bridge, or approximately 350m downstream of the works area. The River Finnow had almost fully cleared at this stage.

Plate 36 The River Finnow within the study area was found to be an important watercourse for juvenile Salmon

Plate 37 Freshwater Pearl Mussel (FPM) is a key conservation interest of the Blackwater River cSAC and occurs both upstream and downstream of the River Finnow confluence. These mussels were recorded in the River Blackwater approximately 150m upstream of the River Finnow confluence.

Plate 38 FPM filtering feeding in the Blackwater River upstream of the Finnow confluence.

Plate 39 FPM filtering feeding in the Blackwater River upstream of the Finnow confluence.

Plate 40 FPM in the River Blackwater approximately 50m downstream of the River Finnow confluence. The substrate in the Blackwater River had a significant layer of freshly deposited silt which most likely originated from the instream works in the Finnow River. Both the River Blackwater and the River Finnow had a luxuriant growth of filamentous algae, indicating enrichment.

Appendix 1 NPWS Designated Areas and Site Synopses

SITE NAME: Blackwater River (Cork/Waterford)
SITE CODE: 002170

Qualifying interests:

- Freshwater pearl mussel (Margaritifera margaritifera) [1029]
- White-clawed crayfish (Austropotamobius pallipes) [1092]
- Sea lamprey (Petromyzon marinus) [1095]
- Brook lamprey (Lampetra planeri) [1096]
- River lamprey (Lampetra fluviatilis) [1099]
- Allis shad (Alosa alosa) [1102]
- Twaite shad (Alosa fallax fallax) [1103]
- Salmon (Salmo salar) [1106]
- Estuaries [1130]
- Mudflats and sandflats not covered by seawater at low tide [1140]
- Perennial vegetation of stony banks [1220]
- Salicornia and other annuals colonizing mud and sand [1310]
- Atlantic salt meadows (Glauco-Puccinellietalia maritimae) [1330]
- Otter (Lutra lutra) [1355]
- Mediterranean salt meadows (Juncetalia maritimi) [1410]
- Killarney fern (Trichomanes speciosum) [1421]
- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation [3260]
- Old sessile oak woods with Ilex and Blechnum in British Isles [91A0]
- Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae) [91E0]
- Taxus baccata woods of the British Isles [91J0]

The River Blackwater is one of the largest rivers in Ireland, draining a major part of Co. Cork and five ranges of mountains. In times of heavy rainfall the levels can fluctuate widely by more than 12 feet on the gauge at Careysville. The peaty nature of the terrain in the upper reaches and of some of the tributaries gives the water a pronounced dark colour. The site consists of the freshwater stretches of the River Blackwater as far upstream as Ballydesmond, the tidal stretches as far as Youghal Harbour and many tributaries, the larger of which includes the Licky, Bride, Flesk, Chimneyfield, Finisk, Araglin, Awbeg (Buttevant), Clyda, Glen, Allow, Dalua, Brogeen, Rathcool, Finnow, Owentaraglin and Awnaskirtaun. The extent of the Blackwater and its tributaries in this site, flows through the counties of Kerry, Cork, Limerick, Tipperary and Waterford. Towns along, but not in the site, include Rathmore, Millstreet, Kanturk, Banteer, Mallow, Buttevant, Doneraile, Castletownroche, Fermoy, Ballyduff, Rathcormac, Tallow, Lismore, Cappoquin and Youghal.

The Blackwater rises in boggy land of east Kerry , where Namurian grits and shales build the low heather-covered plateaux. Near Kanturk the plateaux enclose a basin of productive Coal Measures. On leaving the Namurian rocks the Blackwater turns eastwards along the northern slopes of the Boggeraghs before entering the narrow limestone strike vale at Mallow. The valley deepens as first the Nagles Mountains and then the Knockmealdowns impinge upon it. Interesting geological features along this stretch of the Blackwater Valley include limestone cliffs and caves near the villages and small towns of Killavullen and Ballyhooly; the Killavullen caves contain fossil material from the end of the glacial period. The associated basic soils in this area support the growth of plant communities

which are rare in Cork because in general the countys rocks are acidic. At Cappoquin the river suddenly turns south and cuts through high ridges of Old Red Sandstone. The Araglin valley is predominantly underlain by sandstone, with limestone occurring in the lower reaches near Fermoy.

The site is a candidate SAC selected for alluvial wet woodlands, a priority habitat on Annex I of the E.U. Habitats Directive. The site is also selected as a candidate SAC for floating river vegetation, estuaries, tidal mudflats, Salicornia mudflats, Atlantic salt meadows, Mediterranean salt meadows, perennial vegetation of stony banks and old oak woodlands, all habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for the following species listed on Annex II of the same directive - Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Crayfish, Twaite Shad, Atlantic Salmon, Otter and the plant Killarney Fern.

Wet woodlands are found where river embankments, particularly on the River Bride, have broken down and where the channel edges in the steep-sided valley between Cappoquin and Youghal are subject to daily inundation. The river side of the embankments was often used for willow growing in the past (most recently at Cappoquin) so that the channel is lined by narrow woods of White and Almond-leaved Willow (*Salix alba* and *S. triandra*) with isolated Crack Willow (*S. fragilis*) and Osier (*S. viminalis*). Grey Willow (*S. cinerea*) spreads naturally into the sites and occasionally, as at Villierstown on the Blackwater and Sapperton on the Bride, forms woods with a distinctive mix of woodland and marsh plants, including Gypsywort (*Lycopus europaeus*), Guelder Rose *(Viburnum opulus*), Bittersweet (*Solanum dulcamara*) and various mosses and algae. These wet woodlands form one of the most extensive tracts of the wet woodland habitat in the country.

Marshes and reedbeds cover most of the flat areas beside the rivers and often occur in mosaic with the wet woodland. Common Reed (*Phragmites australis*) is ubiquitous and is harvested for thatching. There is also much Marsh Marigold (*Caltha palustris*) and, at the edges of the reeds, the Greater and Lesser Pond-sedge (*Carex riparia and C. acutiformis*). Hemlock Water-dropwort (*Oenanthe crocata*), Wild Angelica (*Angelica sylvestris*), Reed Canary-grass (*Phalaris arundinacea*), Meadowsweet (*Filipendula ulmaria*), Nettle (*Urtica dioica*), Purple Loosestrife (*Lythrum salicaria*), Marsh Valerian (*Valeriana officinalis*), Water Mint (*Mentha aquatica*) and Water Forget-me-not (*Myosotis scorpioides*).

At Banteer there are a number of hollows in the sediments of the floodplain where subsidence and subterranean drainage have created isolated wetlands, sunk below the level of the surrounding fields. The water rises and falls in these holes depending on the watertable and several different communities have developed on the acidic or neutral sediments. Many of the ponds are ringed about with Grey Willows, rooted in the mineral soils but sometimes collapsed into the water. Beneath the densest stands are woodland herbs like Yellow Pimpernel (*Lysimachia nemorum*) with locally abundant Starwort (*Callitriche stagnalis*) and Marsh Ragwort (*Senecio palustris*). One of the depressions has Silver Birch (*Betula pendula*), Ash (*Fraxinus excelsior*), Crab Apple (*Malus sylvestris*) and a little Oak (*Quercus robur*) in addition to the willows.

Floating river vegetation is found along much of the freshwater stretches within the site. The species list is quite extensive and includes Pond Water-crowfoot (*Ranunculus peltatus*), Water-crowfoot (*Ranunculus* spp.), Canadian Pondweed (*Elodea canadensis*), Broad-leaved Pondweed (*Potamogeton natans*), Pondweed (*Potamogeton* spp.), Water Milfoil (*Myriophyllum* spp.), Common Club-rush (*Scirpus lacustris*), Water-starwort (*Callitriche* spp.), Lesser Water-parsnip (*Berula erecta*) particularly on the Awbeg, Water-cress (*Nasturtium officinale*), Hemlock Water-dropwort, Fine-leaved Water-dropwort (*O. aquatica*), Common Duckweed (*Lemna minor)*, Yellow Water-lily (*Nuphar lutea*), Unbranched Bur-reed (*Sparganium emersum*) and the moss *Fontinalis antipyretica*.

The grassland adjacent to the rivers of the site is generally heavily improved, although liable to flooding in many places. However, fields of more species-rich wet grassland with species such as Yellow-flag (*Iris pseudacorus*), Meadow-sweet, Meadow Buttercup (*Ranunculus acris*) and rushes (*Juncus* spp.) occur occasionally. Extensive fields of wet grassland also occur at Annagh Bog on the Awbeg. These fields are dominated by Tufted Hair-grass (*Deschampsia cespitosa*) and rushes.

The Blackwater Valley has a number of dry woodlands; these have mostly been managed by the estates in which they occur, frequently with the introduction of Beech (*Fagus sylvatica*) and a few conifers, and sometimes of Rhododendron (*Rhododendron ponticum*) and Laurel. Oak woodland is well developed on sandstone about Ballinatray, with the acid Oak woodland community of Holly (*Ilex aquifolium*), Bilberry (*Vaccinium myrtillus*), Greater Woodrush (*Luzula sylvatica*) and Buckler Ferns (*Dryopteris affinis, D. aemula*) occurring in one place. Irish Spurge (*Euphorbia hyberna*) continues eastwards on acid rocks from its headquarters to the west but there are many plants of richer soils, for example Wood Violet (*Viola reichenbachiana*), Goldilocks (*Ranunculus auricomus*), Broad-leaved Helleborine (*Epipactis helleborine*) and Red Campion (*Silene dioica*). Oak woodland is also found in Rincrew, Carrigane, Glendine, Newport and Dromana. The spread of Rhododendron is locally a problem, as is over-grazing. A few limestone rocks stand over the river in places showing traces of a less acidic woodland type with Ash, False Brome (*Brachypodium sylvaticum*) and Early-purple Orchid (*Orchis mascula*).

In the vicinity of Lismore, two deep valleys cut in Old Red Sandstone join to form the Owenashad River before flowing into the Blackwater at Lismore. These valleys retain something close to their original cover of Oak with Downy Birch (*Betula pubescens*), Holly and Hazel (*Corylus avellana*) also occurring. There has been much planting of Beech (as well as some of coniferous species) among the Oak on the shallower slopes and here both Rhododendron and Cherry Laurel (*Prunus laurocerasus*) have invaded the woodland.

The Oak wood community in the Lismore and Glenmore valleys is of the classical upland type, in which some Rowan (*Sorbus aucuparia*) and Downy Birch occur. Honeysuckle (*Lonicera periclymenum*) and Ivy (*Hedera helix*) cover many of the trees while Greater Woodrush, Bluebell (*Hyacinthoides* non-scripta), Wood Sorrel (*Oxalis acetosella*) and, locally, Bilberry dominate the ground flora. Ferns present on the site include Hard Fern (*Blechnum spicant*), Male Fern (*Dryopteris filix-mas*), Buckler Ferns (*D. dilatata, D. aemula*) and Lady Fern (*Athyrium felix-femina*). There are many mosses present and large species such as *Rhytidiadelphus* spp., *Polytrichum formosum, Mnium hornum* and *Dicranum* spp. are noticeable. The lichen flora is important and includes 'old forest' species which imply a continuity of woodland here since ancient times. Tree Lungwort (*Lobaria* spp.) is the most conspicuous and is widespread.

The Araglin valley consists predominantly of broadleaved woodland. Oak and Beech are joined by Hazel, Wild Cherry (*Prunus avium*) and Goat Willow (*Salix caprea*). The ground flora is relatively rich with Pignut (*Conopodium majus*), Wild Garlic (*Allium ursinum*), Garlic Mustard (*Alliaria petiolata*) and Wild Strawberry (*Fragaria vesca*). The presence of Ivy Broomrape (*Orobanche hederae*), a local species within Ireland, suggests that the woodland, along with its attendant Ivy is long established.

Along the lower reaches of the Awbeg River, the valley sides are generally cloaked with mixed deciduous woodland of estate origin. The dominant species is Beech, although a range of other species are also present, e.g. Sycamore (*Acer pseudoplatanus*), Ash and Horse-chestnut (*Aesculus hippocastanum*). In places the alien invasive species, Cherry Laurel, dominates the understorey. Parts of the woodlands are more semi-natural in composition, being dominated by Ash with Hawthorn

(*Crataegus monogyna*) and Spindle (*Euonymus europaea*) also present. However, the most natural areas of woodland appear to be the wet areas dominated by Alder and willows (*Salix* spp.). The ground flora of the dry woodland areas features species such as Pignut, Wood Avens (*Geum urbanum*), Ivy and Soft Shield-fern (*Polystichum setiferum*), while the ground flora of the wet woodland areas contains characteristic species such as Remote Sedge (*Carex remota*) and Opposite-leaved Golden-saxifrage (*Chrysosplenium oppositifolium*).

In places along the upper Bride, scrubby, semi-natural deciduous woodland of Willow, Oak and Rowan occurs with abundant Great Woodrush in the ground flora.

The Bunaglanna River passes down a very steep valley, flowing in a north-south direction to meet the Bride River. It flows through blanket bog to heath and then scattered woodland. The higher levels of moisture here enable a vigorous moss and fern community to flourish, along with a well-developed epiphyte community on the tree trunks and branches.

At Banteer a type of wetland occurs near the railway line which offers a complete contrast to the others. Old turf banks are colonised by Royal Fern (*Osmunda regalis*) and Eared Willow (*Salix aurita*) and between them there is a sheet of Bottle Sedge (*Carex rostrata*), Marsh Cinquefoil (*Potentilla palustris*), Bogbean (*Menyanthes trifoliata)*, Marsh St. John's-wort (*Hypericum elodes*) and the mosses *Sphagnum auriculatum* and *Aulacomnium palustre*. The cover is a scraw with characteristic species like Marsh Willowherb (*Epilobium palustre*) and Marsh Orchid (*Dactylorhiza incarnata*).

The soil high up the Lismore valleys and in rocky places is poor in nutrients but it becomes richer where streams enter and also along the valley bottoms. In such sites Wood Speedwell (*Veronica montana*), Wood Anemone (*Anemone nemorosa*), Enchanter's Nightshade (*Circaea lutetiana*), Barren Strawberry (*Potentilla sterilis*) and Shield Fern occur. There is some Wild Garlic, Three-nerved Sandwort (*Moehringia trinervia*) and Early-purple Orchid (*Orchis mascula*) locally, with Opposite-leaved Golden-saxifrage, Meadowsweet and Bugle in wet places. A Hazel stand at the base of the Glenakeeffe valley shows this community well.

The area has been subject to much tree felling in the recent past and re-sprouting stumps have given rise to areas of bushy Hazel, Holly, Rusty Willow (*Salix cinerea* subsp. *oleifoila*) and Downy Birch. The ground in the clearings is heathy with Heather (*Calluna vulgaris*), Slender St John's-wort (*Hypericum pulchrum*) and the occasional Broom (*Cytisus scoparius*) occurring.

The estuary and the other Habitats Directive Annex I habitats within it form a large component of the site. Very extensive areas of intertidal flats, comprised of substrates ranging from fine, silty mud to coarse sand with pebbles/stones are present. The main expanses occur at the southern end of the site with the best examples at Kinsalebeg in Co. Waterford and between Youghal and the main bridge north of it across the river in Co. Cork. Other areas occur along the tributaries of the Licky in east Co. Waterford and Glendine, Newport, Bride and Killahaly Rivers in Waterford west of the Blackwater and large tracts along the Tourig River in Co. Cork. There are narrow bands of intertidal flats along the main river as far north as Camphire Island. Patches of green algae (filamentous, Ulva species and Enteromorpha sp.) occur in places, while fucoid algae are common on the more stony flats even as high upstream as Glenassy or Coneen.

The area of saltmarsh within the site is small. The best examples occur at the mouths of the tributaries and in the townlands of Foxhole and Blackbog. Those found are generally characteristic of Atlantic salt meadows. The species list at Foxhole consists of Common Saltmarsh-grass (*Puccinellia maritima*), small amounts of Greater Sea-spurrey (*Spergularia media*), Glasswort (*Salicornia* sp.), Sea

Arrowgrass (*Triglochin maritima*), Annual Sea-blite (*Suaeda maritima*) and Sea Purslane (*Halimione portulacoides*) - the latter a very recent coloniser - at the edges. Some Sea Aster (*Aster tripolium*) occurs, generally with Creeping Bent (*Agrostis stolonifera*). Sea Couch-grass (*Elymus pycnanthus*) and small isolated clumps of Sea Club-rush (*Scirpus maritimus*) are also seen. On the Tourig River additional saltmarsh species found include Lavender (*Limoniun* spp.), Sea Thrift (*Armeria maritima*), Red Fescue (*Festuca rubra*), Common Scurvy-grass (*Cochlearia officinalis*) and Sea Plantain (*Plantago maritima*). Oraches (*Atriplex* spp.) are found on channel edges.

The shingle spit at Ferrypoint supports a good example of perennial vegetation of stony banks. The spit is composed of small stones and cobbles and has a well developed and diverse flora. At the lowest part, Sea Beet (*Beta vulgaris*), Curled Dock (*Rumex crispus*) and Yellow-horned Poppy (*Glaucium flavum*) occur with at a slightly higher level Sea Mayweed (*Tripleurospermum maritimum*), Cleavers (*Galium aparine*), Rock Samphire (*Crithmum maritimum*), Sandwort (*Honkenya peploides)*, Spear-leaved Orache (*Atriplex prostrata*) and Babington?s Orache (*A. glabriuscula*). Other species present include Sea Rocket (*Cakile maritima*), Herb Robert (*Geranium robertianum*), Red Fescue (*Festuca rubra*) and Kidney Vetch (*Anthyllis vulneraria*). The top of the spit is more vegetated and includes lichens and bryophytes (including *Tortula ruraliformis* and *Rhytidiadelphus squarrosus*).

The site supports several Red Data Book plant species, i.e. Starved Wood Sedge (*Carex depauperata*), Killarney Fern (*Trichomanes speciosum*), Pennyroyal (*Mentha pulegium*), Bird?s-nest Orchid (*Neottia nidus-avis*, Golden Dock (*Rumex maritimus*) and Bird Cherry (*Prunus padus*). The first three of these are also protected under the Flora (Protection) Order 1999. The following plants, relatively rare nationally, are also found within the site: Toothwort (*Lathraea squamaria*) associated with woodlands on the Awbeg and Blackwater; Summer Snowflake (*Leucojum aestivum*) and Flowering Rush (*Butomus umbellatus*) on the Blackwater; Common Calamint (*Calamintha ascendens*), Red Campion (*Silene dioica*), Sand Leek (*Allium scorodoprasum*) and Wood Club-rush (*Scirpus sylvaticus*) on the Awbeg.

The site is also important for the presence of several Habitats Directive Annex II animal species, including Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*L. fluviatilis*), Twaite Shad (*Alosa fallax fallax*), Freshwater Pearl-mussel (*Margaritifera margaritifera*), Otter (*Lutra lutra*) and Salmon (*Salmo salar*). The Awbeg supports a population of White-clawed Crayfish (*Austropotamobius pallipes*). This threatened species has been recorded from a number of locations and its remains are also frequently found in Otter spraints, particularly in the lower reaches of the river. The freshwater stretches of the Blackwater and Bride Rivers are designated salmonid rivers.

The Blackwater is noted for its enormous run of salmon over the years. The river is characterised by mighty pools, lovely streams, glides and generally, a good push of water coming through except in very low water. Spring salmon fishing can be carried out as far upstream as Fermoy and is very highly regarded especially at Careysville. The Bride, main Blackwater upstream of Fermoy and some of the tributaries are more associated with grilse fishing.

The site supports many of the mammal species occurring in Ireland. Those which are listed in the Irish Red Data Book include Pine Marten, Badger and Irish Hare. The bat species Natterers Bat, 'on?s Bat, Whiskered Bat, Brown Long-eared Bat and Pipistrelle, are to be seen feeding along the river, roosting under the old bridges and in old buildings.

Common Frog, a Red Data Book species that is also legally protected (Wildlife Act, 1976), occurs throughout the site. The rare bush cricket, *Metrioptera roselii* (Orthoptera: Tettigoniidae), has been

recorded in the reed/willow vegetation of the river embankment on the Lower Blackwater River. The Swan Mussel (*Anodonta cygnea*), a scarce species nationally, occurs at a few sites along the freshwater stretches of the Blackwater.

Several bird species listed on Annex I of the E.U. Birds Directive are found on the site. Some use it as a staging area, others are vagrants, while others use it more regularly. Internationally important numbers of Whooper Swan (average peak 174, 1994/95-95/96) and nationally important numbers Bewick's Swan (average peak 35, 1994/95-95/96) use the Blackwater Callows. Golden Plover occur in regionally important numbers on the Blackwater Estuary (average peak 885, 1984/85-86/87) and on the River Bride (absolute max. 2141, 1994/95). Staging Terns visit the site annually (Sandwich Tern (>300) and Arctic/Common Tern (>200), average peak 1974-1994). The site also supports populations of the following: Red Throated Diver, Great Northern Diver, Barnacle Goose, Ruff, Wood Sandpiper and Greenland White-fronted Goose. Three breeding territories for Peregrine Falcon are known along the Blackwater Valley. This, the Awbeg and the Bride River are also thought to support at least 30 pairs of Kingfisher. Little Egret now breed at the site (12 pairs in 1997, 19 pairs in 1998) and this represents about 90% of the breeding population in Ireland.

The site holds important numbers of wintering waterfowl. Both the Blackwater Callows and the Blackwater Estuary Special Protection Areas (SPAs) hold internationally important numbers of Black-tailed Godwit (average peak 847, 1994/95-95/96 on the callows, average peak 845, 1974/75-93/94 in the estuary). The Blackwater Callows also hold Wigeon (average peak 2752), Teal (average peak 1316), Mallard (average peak 427), Shoveler (average peak 28), Lapwing (average peak 880), Curlew (average peak 416) and Black-headed Gull (average peak 396) (counts from 1994/95-95/96). Numbers of birds using the Blackwater Estuary, given as the mean of the highest monthly maxima over 20 years (1974-94), are Shelduck (137 +10 breeding pairs), Wigeon (780), Teal (280), Mallard (320 + 10 breeding pairs), Goldeneye (11-97), Oystercatcher (340), Ringed Plover (50 + 4 breeding pairs), Grey Plover (36), Lapwing (1680), Knot (150), Dunlin (2293), Snipe (272), Black-tailed Godwit (845), Bar-tailed Godwit (130), Curlew (920), Redshank (340), Turnstone (130), Black-headed Gull (4000) and Lesser Black-backed Gull (172). The greatest numbers (75%) of the wintering waterfowl of the estuary are located in the Kinsalebeg area on the east of the estuary in Co. Waterford. The remainder are concentrated along the Tourig Estuary on the Co. Cork side.

The river and river margins also support many Heron, non-breeding Cormorant and Mute Swan (average peak 53, 1994/95-95/96 in the Blackwater Callows). Heron occurs all along the Bride and Blackwater Rivers - 2 or 3 pairs at Dromana Rock; c. 25 pairs in the woodland opposite; 8 pairs at Ardsallagh Wood and c. 20 pairs at Rincrew Wood have been recorded. Some of these are quite large and significant heronries. Significant numbers of Cormorant are found north of the bridge at Youghal and there are some important roosts present at Ardsallagh Wood, downstream of Strancally Castle and at the mouth of the Newport River. Of note are the high numbers of wintering Pochard (e.g. 275 individuals in 1997) found at Ballyhay quarry on the Awbeg, the best site for Pochard in County Cork.

Other important species found within the site include Long-eared Owl, which occurs all along the Blackwater River, and Barn Owl, a Red Data Book species, which is found in some old buildings and in Castlehyde west of Fermoy. Reed Warbler, a scarce breeding species in Ireland, was found for the first time in the site in 1998 at two locations. It is not known whether or not this species breeds on the site, although it is known to nearby to the south of Youghal. Dipper occurs on the rivers.

Landuse at the site is mainly centred on agricultural activities. The banks of much of the site and the callows, which extend almost from Fermoy to Cappoquin, are dominated by improved grasslands

which are drained and heavily fertilised. These areas are grazed and used for silage production. Slurry is spread over much of this area. Arable crops are grown. The spreading of slurry and fertiliser poses a threat to the water quality of this salmonid river and to the populations of Habitats Directive Annex II animal species within it. Many of the woodlands along the rivers belong to old estates and support many non-native species. Little active woodland management occurs. Fishing is a main tourist attraction along stretches of the Blackwater and its tributaries and there are a number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. Both commercial and leisure fishing takes place on the rivers. Other recreational activities such as boating, golfing and walking are also popular. Water skiing is carried out at Villierstown. Parts of Doneraile Park and Anne?s Grove are included in the site: both areas are primarily managed for amenity purposes. There is some hunting of game birds and Mink within the site. Ballyhay quarry is still actively quarried for sand and gravel. Several industrial developments, which discharge into the river, border the site.

The main threats to the site and current damaging activities include high inputs of nutrients into the river system from agricultural run-off and several sewage plants, dredging of the upper reaches of the Awbeg, overgrazing within the woodland areas, and invasion by non-native species, for example Cherry Laurel.

Overall, the River Blackwater is of considerable conservation significance for the occurrence of good examples of habitats and of populations of plant and animal species that are listed on Annexes I and II of the E.U. Habitats Directive respectively; furthermore it is of high conservation value for the populations of bird species that use it. Two Special Protection Areas, designated under the E.U. Birds Directive, are also located within the site - Blackwater Callows and Blackwater Estuary. Additionally, the importance of the site is enhanced by the presence of a suite of uncommon plant species. 14.1.2003

Freshwater Pearl Mussel Habitat Condition Assessment and Survey: Blackwater and Finnow Rivers at Millstreet

July 2015

A Report Prepared pre-design of the Millstreet Wastewater Treatment Plant on behalf of Mott McDonald

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1. INTRODUCTION

ECOFACT Environmental Services Ltd. was commissioned by Mott MacDonald to undertake a survey for Freshwater Pearl Mussel (*Margaritifera margaritifera*) in the River Finnow and Blackwater River at Millstreet. The purpose of the survey was to assess the local Freshwater Pearl Mussel (FPM) habitat and population in the River Finnow and Blackwater River. It is intended to discharge from the proposed upgraded Millstreet Wastewater Treatment Plant (WwTP) to the River Finnow, which in turn flows into the Blackwater River. Ecofact previously carried out a survey of the River Finnow and Blackwater Rivers in 2014 but the effectiveness of the survey was compromised by river works in the lower reaches of the River Finnow. These works involved instream and riparian disturbance which made underwater observation of FPM impossible i.e. from c.200m upstream of Wallis's Bridge on the River Finnow and in the Blackwater River downstream of the Finnow confluence. A significant number of FPM were found in the stretch of the Blackwater River upstream of the River Finnow during the 2014 survey. The current survey includes a repeat of the 2014 survey area as well as the stretch of the Blackwater River from the Finnow confluence to 350m downstream of Keale Bridge, the nearest bridge on the Blackwater downstream of the Finnow confluence.

There have been many records for the Munster Blackwater from targeted surveys carried out by NPWS and EPA staff, by other ecologists on behalf of NPWS, or for other organisations or individuals, the results of which feed back to NPWS as licence returns. In September 2008, Moorkens surveyed a short c.250m section of the River Blackwater upstream of Keale Bridge where a small number of adult mussels were found: 14 on the south bank in gravels under willows and another 17 in similar habitat on the north bank. A Stage 1 (presence/absence) non-continuous survey of the pearl mussel was carried out in the River Blackwater in September 2008 from approximately 6 km upstream to 6 km downstream of Mallow, Co. Cork. Mussels were found at 19 of the 38 examined locations. FPM was found at every site examined upstream of Mallow town, in some places in relatively high density. Downstream of Mallow town, 42 Margaritifera was recorded from only one station. At a location along the north bank of the river adjacent of the Sugar Factory, an estimated density of up to 50-60 individuals per m^2 was found beneath overhanging trees (DEHLG, 2010).

The Freshwater Pearl Mussel is a protected species listed on Annex II of the EU Habitats Directive (1992).The Blackwater River is designated as an SAC for its significant conservation importance with regard to the Freshwater Pearl Mussel, in addition to a number of other Annex II species and Annex I habitats. No detailed surveys have been carried out in the stretch of the Blackwater River from the Finnow confluence to Keale Bridge. Due to the protected status of the Freshwater Pearl mussel, qualified surveyors with a licence from the National Parks and Wildlife Service (NPWS) were required to undertake a survey of the Finnow River and the Blackwater downstream of the Finnow confluence as these watercourses could potentially be affected by the proposed Millstreet WwTP. ECOFACT applied for and were issued a licence (NPWS Licence No. C16 / 2015) to carry out this work. This report details the type and extent of the surveys carried out and the results obtained.

2. METHODOLOGY

2.1 Desk-study review

A desk study was undertaken to identify existing records for the Freshwater Pearl Mussel from within the Blackwater River catchment and to identify the potential for this species to occur within the study area. A desk study review of the NPWS designations for this species relating to the Blackwater River and the relevant legislation in place for the protection of this species was also undertaken.

2.2 FPM Habitat condition assessment

Habitat has a key influence on the presence / absence and density of mussels in a river. An assessment of the habitat condition at four locations was carried out (see Table 1). Two locations were examined on the River Finnow (Wallis's Bridge and Finnow Bridge). Two locations were examined on the Blackwater River (Keale Bridge and approximately 100m upstream of the Finnow confluence. The habitat condition assessments were based on the environmental parameters set out in the Fourth Schedule of the EC Environmental Objectives (Freshwater Pearl Mussel) Regulations (S.I. 296 of 2009). The following evaluations were employed in the current survey, based on the monitoring methods set out in the Draft Freshwater Pearl Mussel Sub-basin Plans (NS2, 2009) and employed by the NPWS during Freshwater Pearl Mussel monitoring:

- Population densities:
  - Abundant (>250 per 100m of channel)
  - Frequent to Common (20 – 250 per 100m)
  - Occasional (less than 20 per 100m)
  - Absent
- Biological water quality:
  - EPA Quality Rating System / Q-Value (Toner *et al,* 2005)
- Filamentous algae:
  - *Rare:* just visible in the field, covers < 1 % of the river bed
  - *Occasional*: covers 1 % to < 5 % of the river bed
  - *Frequent*: covers 5 % to < 25 % of the river bed
  - *Abundant*: covers 25 % to < 50 % of the river bed
  - *Dominant*: covers > 50 % of the river bed
- Macrophytes:
  - Macrophyte cover is present (<5%) within the pearl mussel habitat
- Siltation:
  - no visible silt plume
  - some visible silt
  - a lot of visible silt

Table 1 FPM habitat assessment locations.

Watercourse	Site	Location	Grid reference
Blackwater	Site 1	Keale Bridge (R583)	W129526 93545
Blackwater	Site 2	Ca. 100m upstream of the Finnow confluence	W128278 92538
River Finnow	Site 3	Wallis's Bridge	W128362 92469
River Finnow	Site 4	Finnow Bridge	W126677 92047

Selected chemical water quality parameters were also recorded at the sites using portable meters (YSI EcoSense DO meter, Oakton Conductivity Meter, Oakton pH meter). Oxidation-reduction

potential was measured at 3cm depth and also in the water column at each site using a YSI EcoSense meter. Benthic macroinvertebrates were sampled qualitatively at the four sites using kick-sampling to inform the Q-ratings. This procedure involved the use of a 'D' shaped hand net which was submerged on the river bed 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 located across riffled parts of the watercourses, where depth allowed. Riffles are relatively shallow and coarse-bedded lengths of watercourses over which the stream flows at slower velocity but a higher turbulence. It is known that similar organisms inhabit similar habitats and that the most sensitive species inhabit the riffle areas (Toner *et al,* 2005). Glide is term used in this report to describe a flow characterised by smooth continuous water movement usually over a medium gradient part of river and can exhibit some deposition. Stone washings and vegetation sweeps were also undertaken to ensure a representative sample of the fauna present at each site was collected. All samples of invertebrates were combined for each site and live sorted on the river bank for 20 minutes with the assistance of a headband magnifier. Specimens were fixed in a 10% formalin solution. Identification was undertaken in the laboratory using binocular microscopes and Freshwater Biological Association keys. Prior to kick sampling, the substrate at each location was examined for the presence of FPM and these areas avoided if FPM present.

In determining siltation levels, the water column was observed during kick sampling and the extent of the plume of silt was noted.

2.3 Freshwater Pearl Mussel survey

The Freshwater Pearl Mussel (FPM) survey on the Blackwater River and its tributary the River Finnow comprised Stage 1/2 visual examinations. Surveying for FPM was carried out following the NPWS guidance '*Margaritifera margaritifera Stage 1 and Stage 2 survey guidelines. Irish Wildlife Manuals, No. 12'* (Anon, 2004); and employed both bathyscope survey and snorkelling surveys. The River Finnow from c. 100m upstream of the Tanyard Stream confluence to the main channel of the Blackwater River was subject to a Stage 1 presence - absence survey (Survey section 1).

A Stage 2 survey was carried out on the main channel of the Blackwater River. This involved counting all FPM in the stretch of the river from approximately 110m upstream of the Finnow confluence to c. 830m downstream of the Finnow confluence (Survey section 2). During this survey, the FPM counts for specific parts of the river were combined due to the difficulty in communicating with the bank manager, as riparian areas were difficult to negotiate. Standard field survey sheets were completed on site.

The survey of the Blackwater also included a 20 transect survey of the Blackwater from c. 850m downstream of the Finnow confluence to c. 350m downstream of Keale Bridge, a channel length of c. 1.155km (Section 3). The surveys were carried out under good conditions (predominantly bright and sunny) at normal river levels and good underwater visibility (>2m). Table 2 and Figure 1 provide the type and extent of the surveys carried out at various locations. Table 3 gives the locations of transects. A photographic survey of the river corridor was undertaken, and some representative locations are presented in the Plates section of this report.

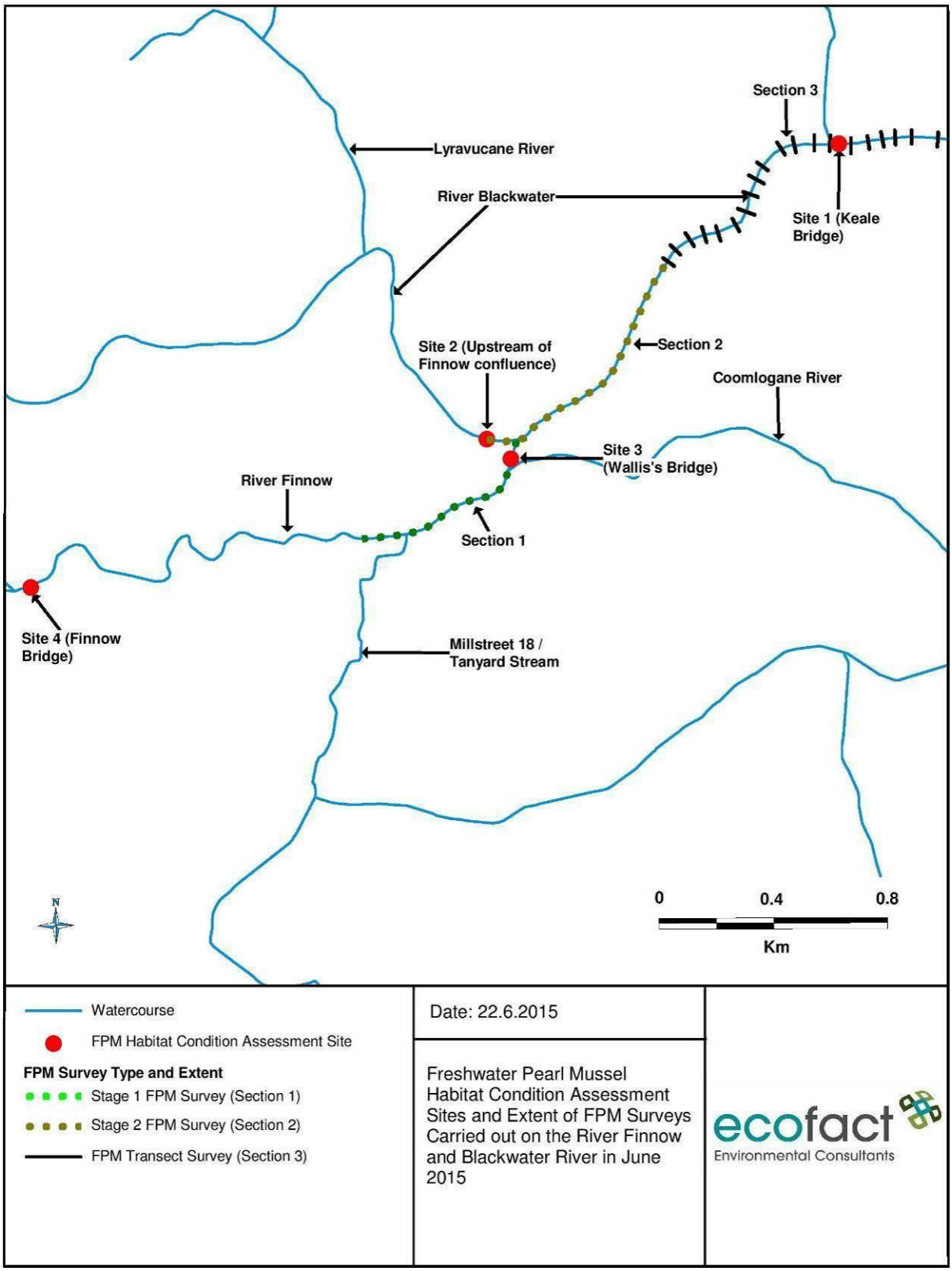

Figure 1 Freshwater Pearl Mussel habitat condition assessment sites and extent of FPM surveys carried out on the River Finnow and Blackwater River in June 2015.

Table 2 Type and extent of the FPM surveys carried out on the River Finnow and Blackwater River in June 2015.

Watercourse	Survey type	Survey section	Upstream limit	Downstream limit (Blackwater confluence)	Channel length surveyed
River Finnow	Stage 1	Section 1	W27848 95198	W28384 92532	0.7km
Blackwater River	Stage 2 (Total count)	Section 2	W28265 92533	W28907 93139	0.945km
Blackwater River	Stage 2 (Transect)	Section 3	W28922 93139	W29875 93554	1.155km

Table 3 Location of the transect surveys carried out on the Blackwater River in June 2015 between c. 830m downstream of the Finnow confluence to c. 350m downstream of Keale Bridge, a channel length of c. 1.18km.

Transect No.	X co-ordinate	Y co-ordinate
1	128922	93139
2	128951	93179
3	129000	93216
4	129049	93231
5	129098	93240
6	129165	93268
7	129194	93312
8	129214	93372
9	129223	93430
10	129263	93463
11	129324	93531
12	129368	93561
13	129442	93545
14	129494	93551
15	129569	93535
16	129630	93544
17	129678	93555
18	129725	93564
19	129781	93565
20	129875	93554

The use of bathyscopes was limited to the survey work undertaken around the existing WwTP discharge, for health and safety reasons. The remaining survey was undertaken using snorkelling. The snorkelling survey was carried out by three ECOFACT staff surveying instream, while a bank manager recorded a suite of data on pre-prepared data sheets (from the NPWS guidance manual) including mussel numbers, grid references of start and finish points for subsections, details of channel width, profile, water depth, substrate, flow regime, instream vegetation, bankside vegetation, adjacent landuse and other features of note. The banks-person also ensured that the instream surveyors provide complete coverage of the channel. GPS records were taken of the locations of each survey stretch and underwater photography was employed to record FPM observations.

3 RESULTS

3.1 Desk study review

3.1.1 Legislative context for the conservation of the Freshwater Pearl mussel

The Freshwater pearl mussel *Margaritifera margaritifera* is listed on Annexes II and V of the EU Habitats Directive (1992). Annex II of the Habitats Directive requires that listed species' habitats are maintained or, where appropriate, restored to favourable conservation status. Under Annex V of the Habitats Directive this species is listed as '*a species of community interests whose taking in the wild and exploitation may be subject to management measures*'. The management of this species must be compatible with the maintenance of favourable conservation status. This species is also listed on Appendix III of the Bern Convention which requires that '*any exploitation of wild fauna specified in Appendix III must be regulated in order to keep the populations out of danger (temporary or local prohibition of exploitation, regulation of transport or sale, etc.)*'. The freshwater pearl mussel is listed as '*Critically Endangered*' in the Republic of Ireland according to the '*Ireland Red List No. 2: Non-Marine Molluscs*' (Byrne *et al*., 2009).

This species is legally protected in Ireland under Schedule 1 of the Wildlife Act (1976) (Protection of Wild Animals) (Statutory Instrument No. 112, 1990) as per the requirements of Section 23 of the Wildlife Act (1976), amended under Section 31 of the Wildlife Act (2000).

The transposition of the EU Water Framework Directive (2000) into Irish legislation, as the European Communities (Water Policy) Regulations 2003 (S.I. No. 722 of 2003) and the more recent European Communities Environmental Objectives (Surface Waters) Regulations (S.I. No. 272 of 2009) require the achievement of 'good ecological status' in Irish waterbodies by 2015. Further measures for the protection of Freshwater pearl mussel are set out in the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations (S.I. 296 of 2009). This legislation sets environmental quality objectives for '*the habitats of the freshwater pearl mussel populations that are within the boundaries of a site notified in a candidate list of European sites, or designated as a Special Area of Conservation, under the European Communities (Natural Habitats) Regulations, 1997 (S.I. No. 94/1997).*'

3.1.2 Overview of the Freshwater pearl mussel in Ireland

There are 96 populations of pearl mussel in the Republic of Ireland, some of which include two or more rivers in close enough proximity to make them one single population (NPWS 2008). A total of 27 populations have been designated within 19 Special Areas of Conservation (SAC) which list *Margaritifera margaritifera* as a qualifying interest. Only one of the 96 populations in the country is considered to be in favourable conservation status, where reproduction and juvenile survival in the remaining populations is not matching adult mortality rates and numbers are declining annually. The conservation status of this species has been evaluated as 'Unfavourable Bad' at a national level (NPWS 2008).

The Article 17 report (NPWS, 2013) on the conservation status of all habitats and species listed on the annexes of the Habitats Directive included a map showing the current distribution of Freshwater Pearl Mussel *Margaritifera margaritifera* (see Figure 2). NPWS (2013) note that the FPM is found in 162 rivers in 104 catchments / sub-catchments across 14 counties (Carlow, Cavan, Clare, Cork, Donegal, Galway, Kerry, Limerick, Mayo, Sligo, Tipperary, Waterford, Wexford and Wicklow).

The gradient in freshwater pearl mussel habitats commonly lies in the interval 0.08–0.3 percent (Skinner *et al*, 2003). The pearl mussel requires stable cobble and gravel substrate with very little fine

material below pea-sized gravel (DEHLG, 2010). Skinner *et al.* (2003) also points out that the majority of adult mussels live in dense beds in substrates of mixed cobble, stone and sand at the tail-end of pools or in the moderate flow channels of river bends. The mussel spends its larval, or glochidial, stage attached to the gills of salmonid fishes. The long-term survival of the freshwater pearl mussel depends ultimately upon host availability. The larvae attach themselves during mid- to late-summer and drop-off the following spring to settle in the riverbed gravel where they grow to adulthood i.e., five years old. This species does not reach reproductive maturity until it reaches between 7 and 15 years old, and may live for over 100 years (NRA, 2009).

The decline of pearl mussel populations in Ireland has mostly occurred from the continuous failure to produce new generations of mussels because of the loss of clean gravel beds, which have become infiltrated by fine sediment and/or over-grown by algae or macrophytes. Filamentous algae can lead to the death of juvenile mussels, through blocking oxygen exchange with the sediment (DoEHLG, 2010).

3.1.3 Overview of the Freshwater pearl mussel in the Blackwater catchment

The Blackwater River catchment is identified as a '*Margaritifera* Sensitive Catchment', supporting an extant population of Freshwater Pearl Mussels, as presented in Figure 3. Records from the catchment include EPA from within 10km of the existing WwTP discharge.

The Freshwater Pearl mussel population is at unfavourable Conservation Status in the Munster Blackwater. It is currently ranked as 24th out of the 27 Freshwater Pearl Mussel SAC populations in the country on the basis of population status, habitat condition and current pressures. Recent declines have been due to a number of issues, which have combined to lower the quality of the river water and river bed habitat. The purpose of the Blackwater River sub-basin management plan is to address the catchment-wide issues that are contributing to this decline and to develop a strategy for implementing measures that will bring the catchment, and thus the population, back to favourable condition (DEHLG, 2010a). The key improvements needed for the Munster Blackwater catchment is to restore juvenile habitats to appropriate condition by simultaneously reducing nutrient and silt inputs to the river.

John Lucey surveyed all EPA sites in the catchment and found live mussels at 18 and dead shells at 2 of the 38 sampling sites on the main channel, from Lisheen Bridge (Cork) to Lismore Bridge (dead shells) in Waterford. He also found living mussels in the Owentaraglin, Allow and Licky River tributaries. Three sites investigated on the main channel of the Munster Blackwater upstream of Rathmore were surveyed and no evidence of Margaritifera was observed at any of these three sites. Heavy siltation was observed at all three locations investigated, indicating that conditions are inimical to the survival of juvenile mussels in this part of the Munster Blackwater system (DEHLG, 2010).

Table 4 shows the national GIS pressure datasets that were used in the assessment of pearl mussel catchments from a morphological perspective. Table 5 gives risks to FPM in the Blackwater catchment (Source: Blackwater (Munster) Freshwater Pearl Mussel second draft Sub-Basin Management Plan: DEHLG, 2010).

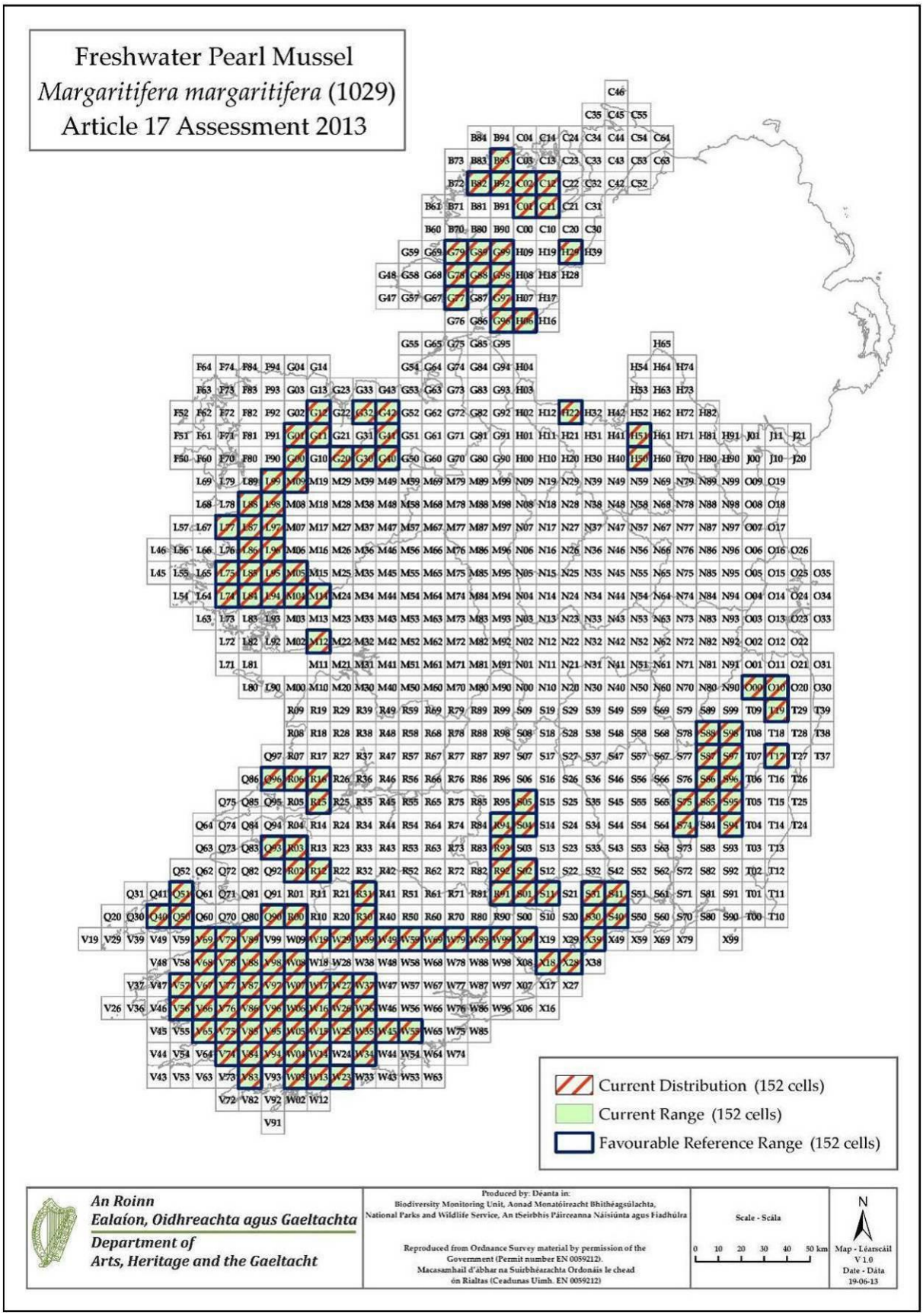

Figure 2 Map taken from the NPWS (2013) Article 17 report showing the current distribution of Freshwater Pearl Mussel *Margaritifera margaritifera.*

Table 4 National GIS pressure datasets for morphology (Source: Blackwater (Munster) Freshwater Pearl Mussel second draft Sub-Basin Management Plan).

	National GIS Pressure Dataset	Present in Munster Blackwater Catchment
Channelisation	OPW Drainage Scheme	
	OPW Drainage District (pre 1945 Arterial Drainage Act), maintained by Drainage Boards, Local Authorities, or OPW	Yes, part of the catchment was drained, namely the Awbeg Drainage District. However the extent is below the national risk assessment threshold of 50% of river length within the water body. Furthermore, it is not within the vicinity of the Pearl Mussel populations and is-at least 10km upstream.
Barriers To Migration	Barriers to Migration (located using expert judgement by CFB but not yet qualified using fish data)	Yes
Overgrazing	National dataset developed by CFB using expert judgement	
	Damaged areas depicted by Commonage Framework Plans through the Rural Environmental Schemes and Programmes (REPS 3) in 1999	Negligible

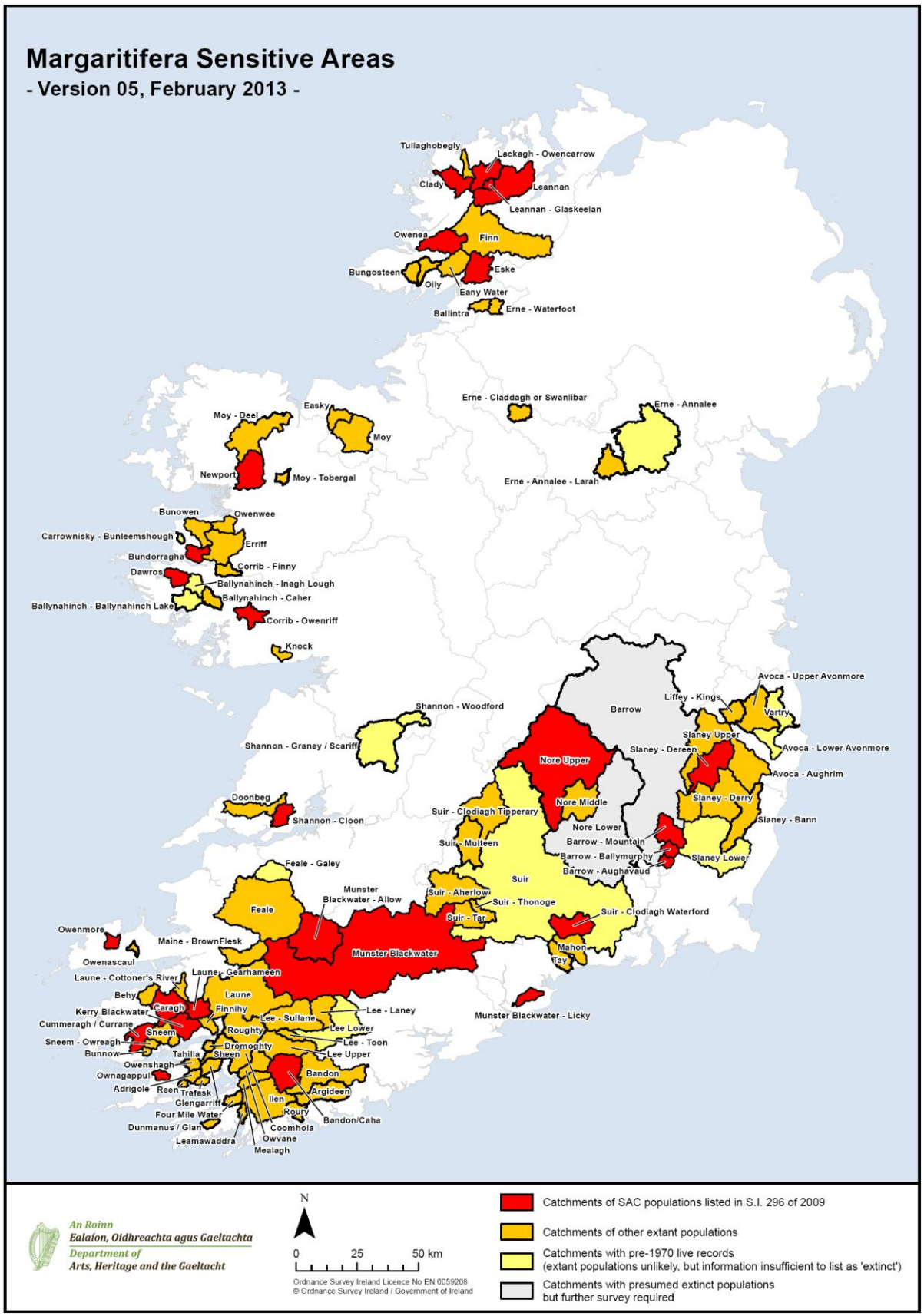

Figure 3 NPWS (2013) map showing the location of Margaritifera Sensitive Areas. The Blackwater catchment is identified as supporting a population listed on S.I. 296 of 2009.

Table 5 Risks to FPM in the Blackwater catchment (Source: Blackwater (Munster) Freshwater Pearl Mussel second draft Sub-Basin Management Plan).

Source	Risk
Point sources	**Significant risks – impacts observed through survey/monitoring** Irish Sugar plc. Lagoons are being filled in and they are turning the land back to a greenfield site for farmland. This is a contaminated site. Munster Joinery Cadbury Ireland – Rathmore - IPPC **Potential significant risks** Within the Munster Blackwater there are approximately 40 WWTPs eighteen of which have been prioritised through the sub-basin management plan due to their risk to the freshwater pearl mussel. The catchment also contains 22 Section 4s and 24 IPPC licensed facilities.
Quarries	**Significant risks – impacts observed through survey/monitoring** One large quarry is located directly beside a pearl mussel population. This is the J.A. Wood at Lackanamona in Mallow. This is an extremely large quarry which extracts rock and runs adjacent to a pearl mussel stretch. **Potential significant risks** Nineteen quarries are located within the catchment with the potential to have significant risk of sediment loss if not properly designed and managed.
Abstractions	**Significant risks – impacts observed through survey/monitoring** Mallow racecource has a small scale abstraction for sprinklers which are operated 2-3 days prior to a race meeting. This is in close proximity to the freshwater pearl mussel population. **Potential significant risks** Within the Munster Blackwater Catchment, one waterbody was classified as “1a”; three at “1b”, one at “2a” and the remaining ninety three waterbodies were classified as “2b” from the ERBD Abstraction PoMs. The waterbodies which were classified as “1a” and “1b” are the most significant risks as these are located close to the pearl mussel populations.
Physical Modifications	**Significant risks – impacts observed through survey/monitoring** Cleared banks Reinforced banks Straightened channels Removal of bankside vegetation **Potential significant risks** Any future flood alleviation schemes or physical modifications to the bank or channel in the vicinity of the freshwater pearl mussel
Agriculture	**Significant risks – impacts observed through survey/monitoring** Poaching, bank erosion and collapse, trampling and disturbance of river bed by livestock, machinery fording, drains discharging silt **Potential significant risks** The lack of access to detailed agricultural land-use data precludes detailed risk assessment, but data from orthophotos/NPWS Commonage Framework Plans, Livestock Unit Density maps and soil types indicates that (e.g. a large percentage of the catchment is covered by relatively intensive pasture and also there is a significant area of tillage within the catchment with associated risks of nutrient/sediment losses). All agricultural activities that can lead to soil erosion (e.g. drainage, land reclamation, ploughing, poaching, overgrazing) and/or nutrient losses (e.g. slurry-spreading, fertilisation) are potential significant risks.
On-site waste water treatment systems	**Significant risks – impacts observed through survey/monitoring** Significant recent increase in one-off houses in close proximity to the river **Potential significant risks** 7557 on-site systems on extreme risk potential, 4724 on very high risk potential, 2625 on high risk potential, 3525 on moderate risk potential and 44 on low risk potential settings. OSWWTS on high risk potential settings pose potential significant risks in terms of nutrient loss. In particular, inappropriately designed and/or poorly maintained OSWWTS are a potential significant risk.
Forestry	**Significant risks – impacts observed through survey/monitoring** N/A **Potential significant risks** Forestry on drained peat and peaty soils is considered a potential significant risk owing to resultant hydrological changes, sediment losses from eroding drains and nutrient losses (particularly ammonia) from peat decomposition. Within the Munster Blackwater 15,777 ha was planted before 1990 and is likely to have insufficient buffering a further 16,813 ha was planted post 1990. The following forest operations are also considered significant risks: fertilisation on peat and peaty soils (nutrient enrichment); drainage/other ground preparation, road-construction, thinning and clear-felling on peat, peaty and other highly erodible soil types, particularly on steep slopes (sedimentation).
Other issues	**Significant risks – impacts observed through survey/monitoring** Forded crossings both vehicular and animal

3.2 Habitat condition assessment

The results of the habitat conditions assessment are summarised in Table 6 below. A species list of the macroinvertebrate communities recorded at each site is provided in Appendix 1. The site results are discussed individually below. Selected chemical water quality parameter results are given in Table 7. Figure 4 gives the results of the FPM habitat condition assessments.

Table 6 Habitat condition assessment of the sites investigated on the River Finnow and the Blackwater in June 2015.

Site No.	1	2	3	4
FPM Population Density	Frequent	Frequent	Absent	Absent
Biological water quality (Q-Value)	Q4-5	Q4-5	Q4	Q4
Siltation	Some visible silt	Some visible silt	Some visible silt	Some visible silt
ORP (3cm)	132	177	242	147
ORP (water column)	198	258	307	295
Aquatic vegetation (% coverage)				
Submerged	1-5	1-5	5-25	25-50
Emergent	0	0	1-5	1-5
Bryophytes	5	1-5	1-5	1-5
Algae				
Filamentous	Occasional	Frequent	Frequent	Occasional
Diatoms	Abundant	Abundant	Abundant	Frequent

Algae - *Rare (just visible in the field, covers < 1 % of the river bed), Occasional (covers 1 % to < 5 % of the river bed), Frequent (covers 5 % to < 25 % of the river bed), Abundant (covers 25 % to < 50 % of the river bed), Dominant (covers > 50 % of the river bed).*

Table 7 Selected chemical water quality parameter results for the sites investigated on the Blackwater and Finnow Rivers in June 2015.

Site No.	1	2	3	4
Temperature (°C):	12.1	16	15	14.3
Dissolved Oxygen (%)	92	99.3	102.1	137.8
Dissolved Oxygen (ppm)	9.9	9.77	10.33	14.1
Conductivity (µS)	176.4	170.2	173.4	161.7
pH	8.2	8.3	8.2	8.5

3.2.1 Site 1

Site 1 was located on the Blackwater River at Keale Bridge (see Figure 4). FPM were frequent at Site 1 (20 - 250 per 100m).

Kick-sampling was undertaken at a suitable riffled section, directly upstream of the R583 Bridge. The macroinvertebrate community at this location was characterised by a rich macroinvertebrate assemblage. Group A pollution sensitive mayfly larvae of *Heptagenia sulphurea* were common. Mayfly larvae of Group C *Ephemerella ignita* and *Baetis rhodani* were also common while pollution sensitive *Rhithrogena semicolorata* was present. Pollution sensitive stonefly larvae of *Isoperla grammatica* were scarce while *Chloroperla torrentium* were found in small numbers. Cased and uncased Tricoptera were present in fair to common numbers and included larval *Agapetus fuscipes, Hydropsyche siltalai* and *Rhyacophila dorsalis.* Biological water quality at this location was rated as Q4-5 using the EPA freshwater biological monitoring system (Toner *et al,* 2005).

The substrate in the Blackwater River at Site 1 had occasional filamentous algae and abundant diatom coverage. The larger substrates near the sides of the channel and in slow flowing areas had a

light dusting of silt associated with diatom cover. Submerged aquatic vegetation was in the order of 1-5%.

3.2.2 Site 2

Site 2 was located on the Blackwater River upstream of the confluence with the River Finnow (see Figure 4). FPM were frequent at Site 2. A FPM within the 40-50mm size range (total length) was recorded at this location while carrying out a check on the substrate prior to kick sampling. This specimen was unintentionally taken from the river as it had the appearance of a slim stone but was returned to the river immediately.

Group A *R. semicolorata* was common at this site and small numbers of another Heptagenid *H. sulphurea* were recorded. The pollution sensitive Plecopteran *I. grammatica* were found in small numbers while *Chloroperla torrentium* was scarce. *E. ignita* were common and *Baetis rhodani* were numerous at this location. Numbers of the Mollusc *Potamopyrgus jenkinsi* and the river limpet *Anclyus fluviatilis w*ere scarce. Biological water quality was rated as Q4-5, taking account of the rich macroinvertebrate community, the relatively low levels of siltation, and stable oxygenation conditions (close to 100% saturation).

Shading by mature deciduous trees coupled by fast flow at Site 2 was deemed to influence aquatic vegetation coverage in this section of the river (1-5% submerged and 0% emergent vegetation). Bryophyte coverage was low at 1-5%. Abundant diatom cover was recorded at this site.

3.2.3 Site 3

Site 3 was located on the River Finnow at Wallis's Bridge (see Figure 4), approximately 100 metres upstream of the confluence with the Blackwater River. FPM are absent from this stretch of the river.

A diverse macroinvertebrate assemblage was recorded here with 20 families found. Among the benthic community were larval *R. semicolorata* (fair numbers), *H. sulphurea* (scarce) both pollution sensitive mayfly indicators as well as pollution sensitive stonefly larvae of *C. torrentium* and *I. grammatica* (both scarce). Pollution tolerant (Group C) mayfly larvae of *B. rhodani* and *E. ignita* were numerous and common, respectively, while *Caenis* sp was scarce. Pollution tolerant *Asellus aquaticus,* the fish leech *Piscicola geometra* and the leech *Erpobdella testacea* were present at this location. Biological water quality was rated as Q4, taking account of the macroinvertebrate communities present and their relative abundance.

Abundant diatom coverage was recorded at this site while filamentous algae was frequent (5-25% coverage). Submerged macrophyte coverage was 10-25% while aquatic vegetation (emergent and bryophyte) coverage was 1-5%.

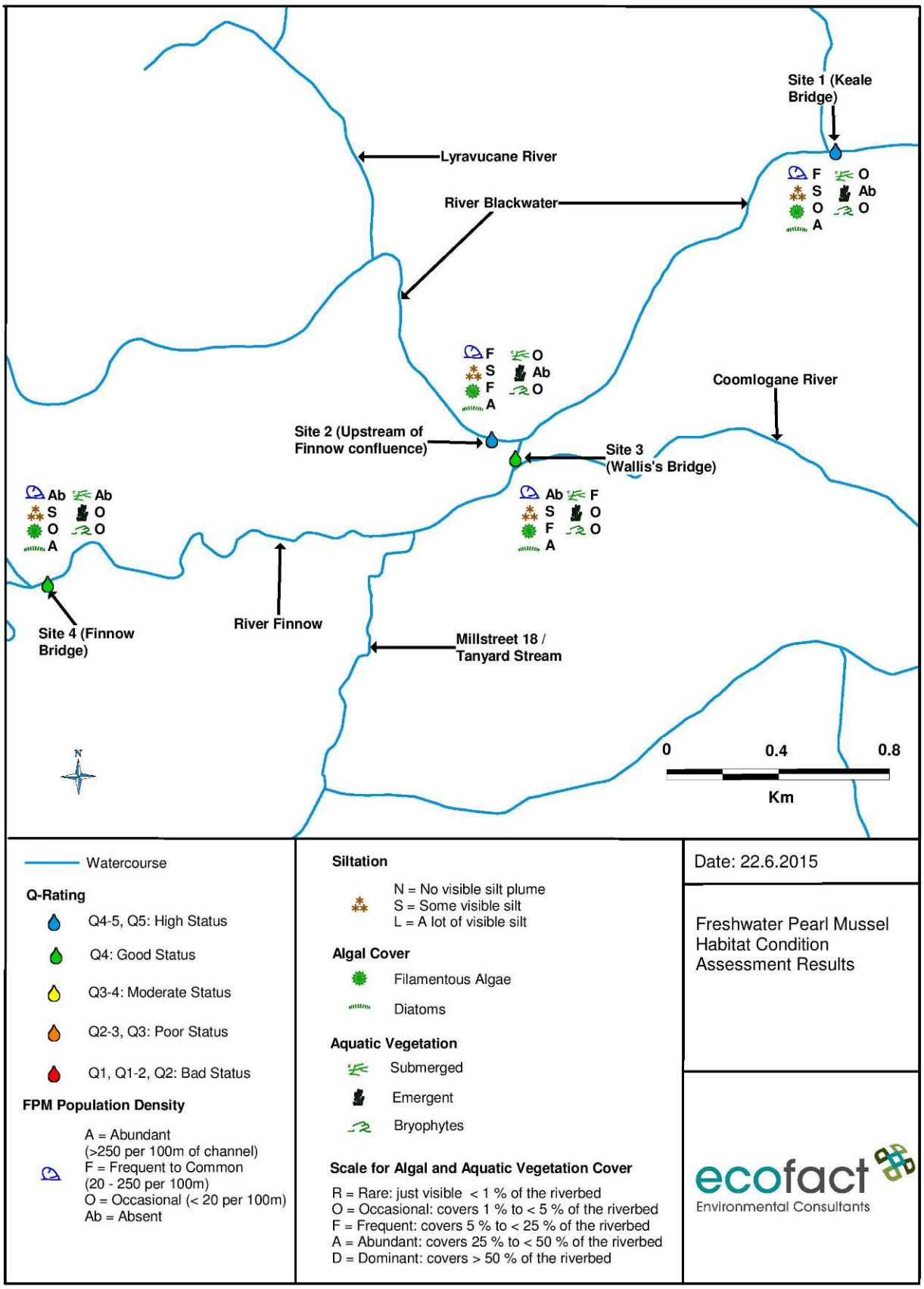

Figure 4 Results of the FPM habitat condition assessments carried out on the Blackwater River and River Finnow in June 2015.

3.2.4 Site 4

Site 4 was located on the River Finnow at Finnow Bridge. FPM were not recorded from this stretch of the river.

This site is characterised by a good diversity of *Heptagenidae* including *Ecdyonurus* sp. (scarce), *R. semicolorata* (fair numbers) and *H. sulphurea* (small numbers). Plecopteran diversity was considered to be representative of good ecological conditions with small numbers of *Chloroperla torrentium* and *I. grammatica* present. Pollution tolerant *Baetis rhodani* and Simulidae larvae were both numerous; the degree of floating river vegetation presumably raising the abundance of the latter. Trichopterans were well represented at this site with Group B cased larvae of *A. fuscipes, Lepidostoma hirtum, Silo pallipes, Sericostoma personatum* as well as Group C caseless larvae of *H. siltalai, R. dorsalis* and *Polycentropus* sp. Biological water quality was rated as Q4 with regard to the macroinvertebrate diversity and composition at this location, coupled with other factors such as the degree of siltation and algal growths (low).

Frequent diatom coverage was recorded at this site. Filamentous algae and diatoms were occasional and frequent at this site, respectively. Some silt was recorded in interstitial spaces at this site, which was evident from disturbance of the substrate during kick-sampling.

3.2.2 Freshwater pearl mussel survey

The current surveys were undertaken over 3 days with clear to low cloud cover. Normal flow conditions were present in the Blackwater and Finnow Rivers following an extended period of dry weather. Flows in both the Blackwater and Finnow Rivers were very clear and were evaluated as being optimal for Freshwater Pearl Mussel survey. The results of the FPM surveys for Section 1, Section 2 and Section 3 are given below. FPM field survey data sheets are provided in Appendix 2.

3.2.2.1 Section 1

Survey section 1 was on the River Finnow from c. 100m upstream of the Tanyard Stream confluence to the main channel of the Blackwater River, a channel length of c. 0.7km. This stretch of river was subject to a Stage 1 survey to determine the presence / absence of FPM. FPM were not encountered during this survey. A tree that had fallen into the River Finnow approximately 100m upstream of Finnow Bridge obscured the view of the riverbed in one part of this river. The area under this tree was the only part of Section 1 that could not be surveyed for FPM. The occurrence of FPM in this part of the river is considered highly unlikely.

3.2.2.2 Section 2

Survey section 2 was carried out on the Blackwater River from approximately 110m upstream of the confluence with the River Finnow to approximately 830m downstream of the Finnow confluence, a stretch of 0.945 km. A FPM count was carried out along this reach of the river. The results of this survey are presented in Table 8 and are shown in Figure 5. A total of 1456 live adult FPM were recorded, corresponding to a density of 1541 per km. A total of 244 FPM were recorded in the surveyed stretch upstream of the Finnow confluence, all on the right side of the channel. Downstream of the Finnow confluence, a total of 1053 FPM were identified at the left side of the channel, 154 on the right side of the channel and 5 mid-channel. The vast majority of the FPM in this section of the river were recorded close to the left bank, in sluggish flow / no flow under trees, and in depths generally less than 50cm. Downstream of the Finnow confluence, it is noted that siltation and / or depth obscured parts of the channel and that some FPM may have not been recorded, particularly in the mid-section.

Table 8 Results of the FPM Stage 2 (count) on the Blackwater River from approximately 110 metres upstream of the confluence with the River Finnow to approximately 830m downstream of the Finnow confluence in June 2015.

	Co-ordinates X	Y	Position in channel	Live FPM	FPM Shell	Predominant Flow
Upstream of the Finnow confluence	128265	92533	RB	4		Glide
	128266	92533	RB	2		Glide
	128275	92528	RB	6		Glide
	128277	92529	RB	5		Glide
	128277	92530	RB	12		Glide
	128279	92530	RB	11		Glide
	128286	92529	RB	55		Riffle
	128289	92529	RB	7		Riffle
	128301	92522	RB	13		Riffle
	128297	92533	RB	28		Riffle
	128301	92525	RB	8		Riffle
	128304	92525	RB	3		Riffle
	128303	92520	RB	8		Riffle
	128310	92528	RB	2		Riffle
	128315	92520	RB	15		Riffle
	128311	92517	RB	8		Riffle
	128314	92522	RB	6		Riffle
	128321	92530	RB	4		Riffle
	128324	92532	RB	5		Riffle-Glide
	128329	92529	RB	16		Glide
	128329	92527	RB	5		Riffle
	128356	92537	RB	4		Riffle
	128354	92532	RB	9		Riffle
	128358	92525	RB	4		Glide
	128374	92528	RB	4		Glide
Total				**244**	**0**	
Downstream of the Finnow confluence	128402	92535	LB + MC	3		Glide
	128450	92559	RB	5		Glide/pool
	128459	92579	LB	16		Glide
	128467	92590	LB	100		Glide
	128480	92594	LB	100		Glide
	128486	92608	LB	300		Glide
	128487	92620	LB	129	3	Glide
	128571	92650	LB - RB	161	1	Glide
	128575	92656	LB + MC + RB	12		Glide
	128595	92665	RB	8		Riffle
	128604	92675	RB	3		Riffle
	128617	92671	RB	10		Glide
	128620	92679	RB	10		Glide
	128637	92684	RB	35	6	Glide
	128727	92736	LB + RB	201		Glide
	128776	92832	LB + RB	34	4	Glide
	128810	92907	LB + RB	40		Glide
	128918	93097	RB	6		Glide
	128907	93107	LB	39	4	Glide
Total				**1212**	**18**	

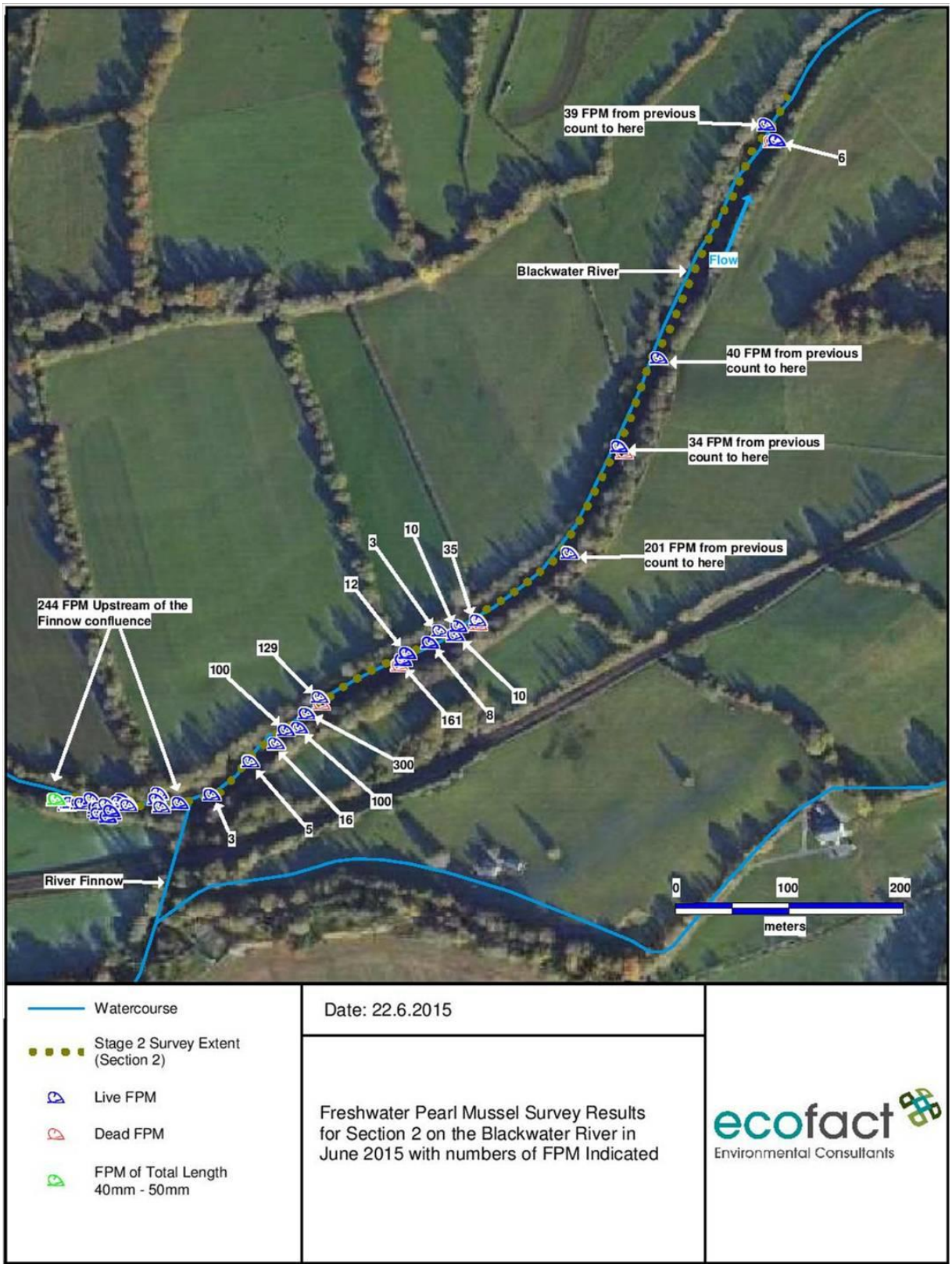

Figure 5 Freshwater Pearl Mussel survey results for survey Section 2 on the Blackwater River in June 2015.

3.2.2.3 Section 3

Section 3 was located on the Blackwater River and included a 20 transect survey of the channel from c. 850m downstream of the Finnow confluence to c. 350m downstream of Keale Bridge, a channel length of c. 1.15km. The results of the 20 transect survey are presented in Table 9 and are shown in Figure 6. A total of 57 live adult FPM and 3 shells were counted across the 20 transects. Most of the FPM were recorded in the left side of the river (n = 32), with 16 recorded near the right bank and 9 recorded near the centre of the channel. The average depth of the river at the transect locations was c. 60cm and the flow was predominantly glide. The width of the river surveyed at each transect was c. 4m. Based on the fluvial area surveyed and the numbers of FPM counted in the surveyed area, the FPM count per km is 713.

Table 9 Transect survey results carried out on the Blackwater River in June 2015 between c. 850m downstream of the Finnow confluence to c. 350m downstream of Keale Bridge in June 2015.

Transect No.	Co-ordinates		Position of live FPM in Channel			Dead shells	Flow	Mean Depth (cm)
	X	Y	L	M	R			
1	128922	93139	-	-	-	1	Riffle	30
2	128951	93179	3	-	-	-	Fast Glide	40
3	129000	93216	2	-	-	-	Glide	100
4	129098	93240	5	-	-	-	Glide	45
5	129098	93240	-	-	13	-	Glide	150
6	129165	93268	-	-	-	2	Glide	100
7	129194	93312	11	-	-	-	Glide	70
8	129214	93372	4	2	-	1	Glide	50
9	129223	93430	-	1	-	-	Glide	70
10	129263	93463	-	1	-	-	Glide	50
11	129324	93531	-	-	-	-	Glide	55
12	129368	93561	-	1	-	1	Glide	40
13	129442	93545	-	-	-	1	Glide	40
14	129494	93551	-	1	3	-	Riffle/Glide	35
15	129569	93535	-	-	-	-	Glide	45
16	129630	93544	2	-	-	-	Glide	50
17	129725	93564	-	-	-	-	Glide	40
18	129725	93564	-	-	-	-	Riffle	30
19	129781	93565	-	4	-	-	Glide	50
20	129875	93554	5	-	-	-	Glide	60

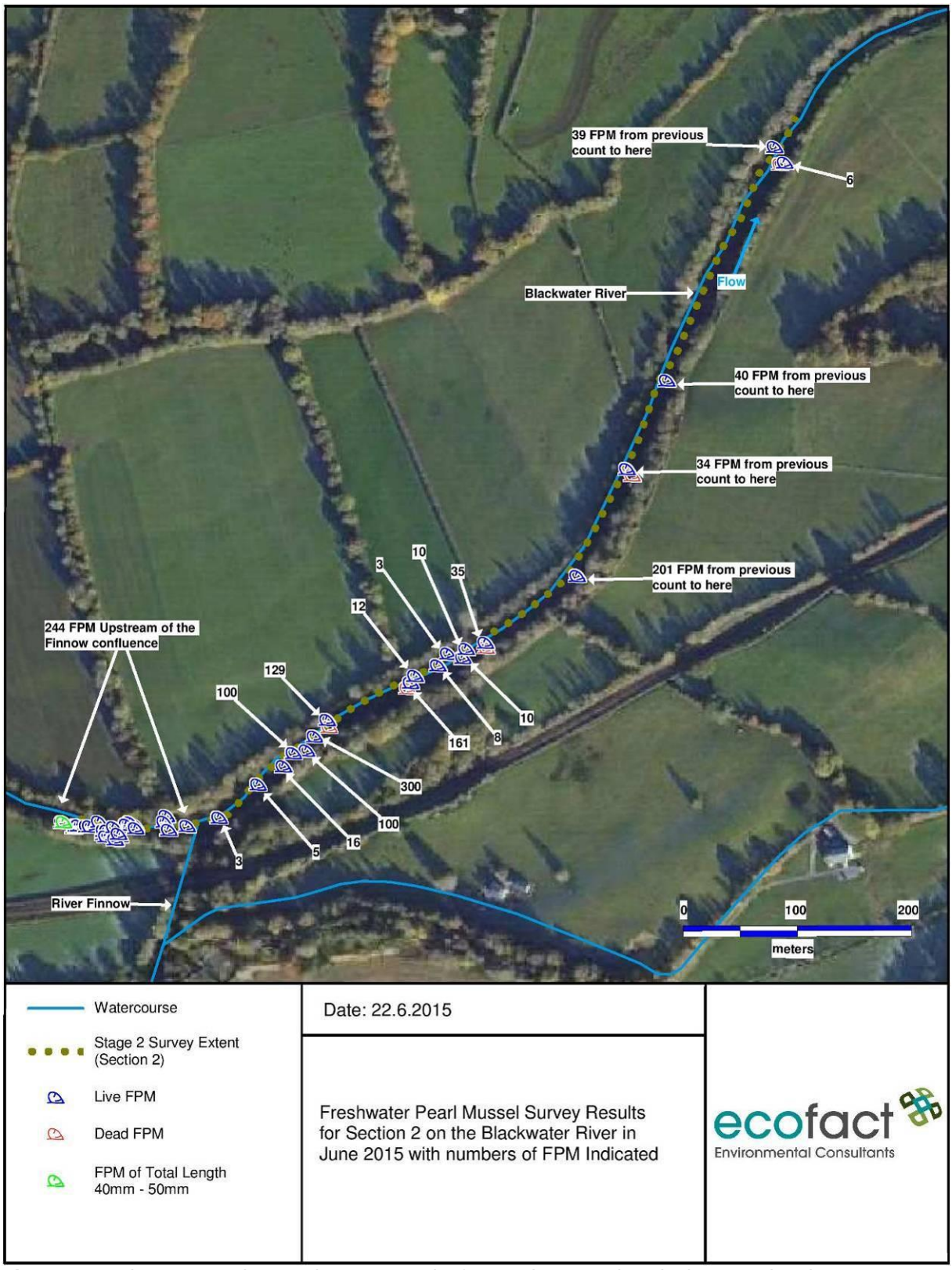

Figure 6 Freshwater Pearl Mussel survey results for Section 3 on the Blackwater River in June 2015.

4. Discussion

The shaded areas of the Blackwater River from c. 100m upstream of the Finnow confluence to c. 350m downstream of Keale Bridge were found to be the most important with regard to the adult FPM population in the survey area. This shading at the side of the river is provided largely by native trees such as willow and ash. Within the shaded parts of the river, the shallower areas were found to be the most important habitat for FPM. The substrates where FPM were found varied from predominantly silt to cobble but most were recorded in mixed substrates. Though some FPM were recorded away from the sides of the river, the centre of the channel is less favoured by the species probably due to scouring of the thalweg (mostly in / near middle of river) during spates. The bed of the river in deep pools along the surveyed stretch could not be seen and such areas may support FPM that were not detected.

No FPM were found in the River Finnow which is the receiving water for the proposed upgraded Millstreet WwTP. Both sites on the River Finnow were rated Q4 with some silt also occurring at both locations. The upstream site on the River Finnow was deemed slightly more favourable with regard to FPM requirements taking account of algal conditions. The surveyed stretch of the main channel of the Blackwater was found to be extremely important for FPM and ranged in density from common (20 - 250 per 100m of channel) to abundant (>250 per 100m of channel) from approximately 110m upstream of the confluence with the River Finnow to approximately 830m downstream of the Finnow confluence, a stretch of 0.945 km. A total of 1,456 FPM were recorded along this stretch corresponding to a density of 1,541 per km. In the 20 transect survey of the Blackwater River c. 850m downstream of the Finnow confluence to c. 350m downstream of Keale Bridge, the estimated density of FPM was 713 per km. It is noted that the FPM density along the stretch subject to the transect survey could be significantly less, broadly equal to or even significantly more than the stretch subject to the full count.

Siltation conditions at all habitat condition assessment locations were considered normal, with some silt recorded upon substrate disturbance. There was considerably less silt in riffled areas, as would be expected, but siltation in depositing and slower areas was considerable with regard to juvenile FPM. In general, a light dusting of silt was recorded on the substrates throughout the survey area. While this level of silt may not have adverse implications for most macroinvertebrates, it is considered to be of significance for juvenile FPM which requires oxygenation at depth within substrates. Dissolved Oxygen (D.O.) concentration was 92% and 99.3% at Site 1 and Site 2 on the Blackwater River, indicative of stable oxygenation conditions and good water quality. D.O. at Site 3 and Site 4 on the Fiver Finnow was 102.1% and 137.8% respectively, the latter result suggestive of moderately polluted conditions. Oxidation Reduction Potential (ORP) was found to decline significantly within the substrates of the four habitat condition assessment sites.

The discharge from the WwTP within the Drishane Castle grounds is having at least a localised adverse impact on water quality. Considerable siltation and sewage fungus were visible in the River Finnow in the vicinity of the outfall at the time of surveying. In addition, bank erosion along the River Finnow within the grounds of Drishane Castle following instream works carried out in 2014 (see Plates 55 - 57). This is a source of silt in the lower reach of the Finnow and the Blackwater downstream of the confluence.

There is a good population of host fish in both the Blackwater and Finnow Rivers with regard to FPM glochidia (larvae). The salmonid population in both the Blackwater and Finnow Rivers was considered healthy given the abundance of juveniles.

An estimated density of up to 50-60 FPM per m^2 was recorded in the River Blackwater along the north bank adjacent to the Sugar factory in Mallow 2008 (DEHLG, 2010). The maximum densities recorded

during the current survey were estimated at 20-30 FPM per m^2. It is notable that the highest density of FPM in the 2008 study at Mallow and the current survey was recorded under overhanging trees. It is mentioned in (DEHLG, 2010) that where surveying was been carried out at the sites upstream of Mallow, mussels were found in correct physical habitat but in poor unsustainable conditions. The same can be said of the majority of FPM recorded in the current study, with silt was deeply embedded into the substrate where FPM occurred with the exception of the riffled areas. Apart from the faster flowing parts of the River Blackwater and the River Finnow within the current survey stretch, the FPM habitat is considered unsuitable for juveniles and therefore FPM recruitment. Disturbed substrate at the left side of the pool in the Blackwater River downstream of the River Finnow confluence indicated deeply embedded silt (see Plate 28). It is noted in Moorkens (1999) that juvenile FPM require an aerated flow of interstitial water and they filter feed during this time. Within the riffled areas of the current survey sections, aeration of the interstitial spaces may be sufficient for juvenile FPM.

Only a single FPM <50mm was recorded during the current study. This FPM was within the 40-50mm size range (total length) and was found at Site 2. Results from studies of mussel shells in Sweden show that a mussel with normal growth rate is around 10 years old when it reaches 20 millimetres in length and almost 20 years old when it reaches 50 millimetres, and that around 50 percent of the mussels that are <50 millimetres in length are also buried (Dunca 2009). Freshwater Pearl Mussels mature between seven and 15 years of age (Smith, 1978). It is therefore thought that the young mussel found at Site 2 was either an old juvenile or a young adult.

Ecological Quality Objectives for FPM habitat are given in the fourth schedule of S.I. 296 of 2009, the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (DEHLG, 2009). Table 10 gives the Ecological Quality Objectives for FPM habitat and an assessment of the habitat condition sites examined in the current survey in relation to these objectives. With regard to macroinvertebrates, the habitat condition sites on the Blackwater River satisfy the EC FPM objective of 'High status' with both Site 1 and Site 2 rated Q4-5. The River Finnow fails on the basis of macroinvertebrates with Site 3 and Site 4 both rated Q4 'Good status'. All locations fail on the grounds of filamentous alage, phytobenthos, and siltation.

Table 10 Ecological Quality Objectives for FPM habitat and an assessment of the habitat condition sites examined in the current survey of the Blackwater and Finnow Rivers in June 2015.

Element	Objective	Notes	Blackwater		Finnow	
			Site 1	Site 2	Site 3	Site 4
Macroinvertebrates	EQR ≥0.90	High status	Pass	Pass	Fail	Fail
Filamentous algae (Macroalgae)	Absent or Trace (<5%)	Any filamentous algae should be wispy and ephemeral and never form mats	Fail	Fail	Fail	Fail
Phytobenthos (Diatoms)	EQR ≥0.93	High status	Fail*	Fail*	Fail*	Fail*
Macrophytes — rooted higher plants	Absent or Trace (<5%)	Rooted macrophytes should be absent or rare within the mussel habitat	Pass	Pass	Fail	Fail
Siltation	No artificially elevated levels of siltation	No plumes of silt when substratum is disturbed	Fail	Fail	Fail	Fail

**based on field observations (coverage and diversity)*

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PLATES

Plate 1 Site 1 was located at Keale Bridge (R583) on the Blackwater River.

Plate 2 Site 2 was located on the Blackwater River approximately 100m upstream of the River Finnow confluence.

Plate 3 Site 3 was located on the River Finnow at Wallis's Bridge.

Plate 4 Site 4 was located on the River Finnow at Finnow Bridge.

Plate 5 Substrate in the Blackwater River at Site 1 had occasional filamentous algae and abundant diatom coverage.

Plate 6 Cobble substrate in the Blackwater River at Site 1 has a light dusting of silt associated with diatom cover near the sides of the channel and in slow flowing areas. Submerged aquatic vegetation was in the order of 1-5%.

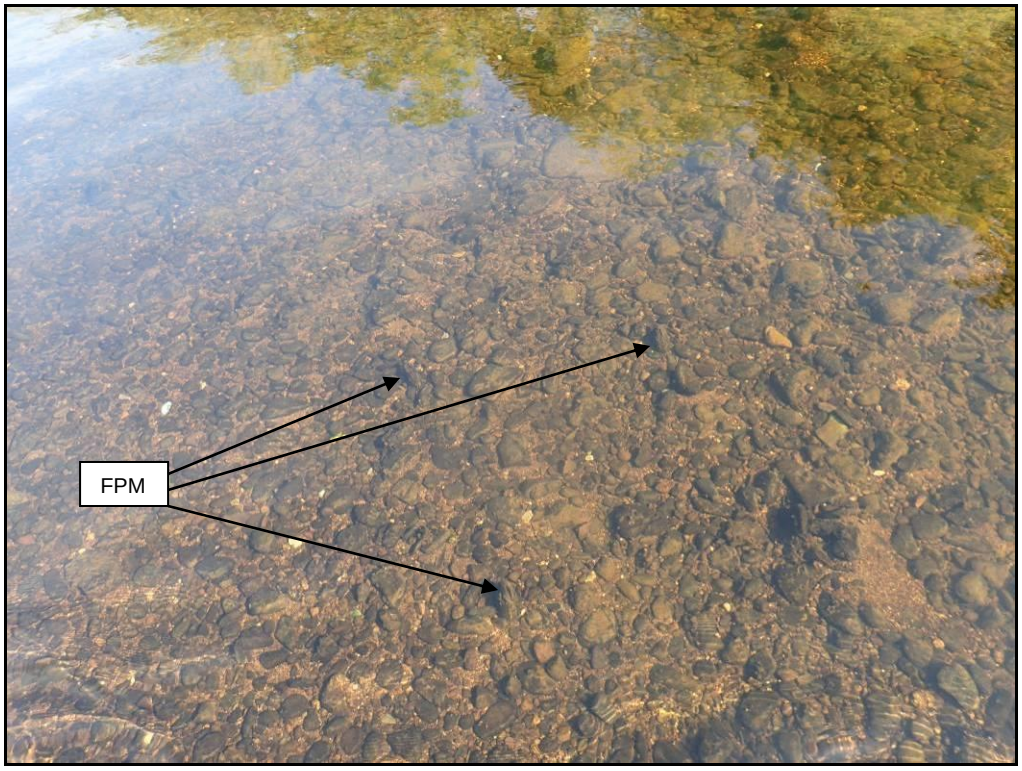

Plate 7 FPM were frequent at Site 1 - Keale Bridge.

Plate 8 FPM near the right bank of the Blackwater River at Site 1.

Plate 9 Cobble taken from the Blackwater River at Site 2 with abundant diatom cover. The gastropod mollusc *Ancylus fluviatilis* is an algal grazer that can feed on diatoms.

Plate 10 Shading by mature deciduous trees coupled by fast flow at Site 2 was deemed to influence aquatic vegetation coverage in this section of the river (1-5% submerged and 0% emergent vegetation). Bryophyte coverage was low at 1-5%.

Plate 11 Adult FPM (right) and a significantly younger specimen (left). The smaller FPM was within the 40-50mm size range (total length) and was found at Site 2.

Plate 12 Underwater view of the substrate at Site 2. A light dusting of silt can be seen here, trapped by the diatom coating on rocks.

Plate 13 Juvenile salmonid recorded in the Blackwater River at Site 1. There is a good population of host fish in both the Blackwater and Finnow Rivers with regard to FPM glochidia (larvae).

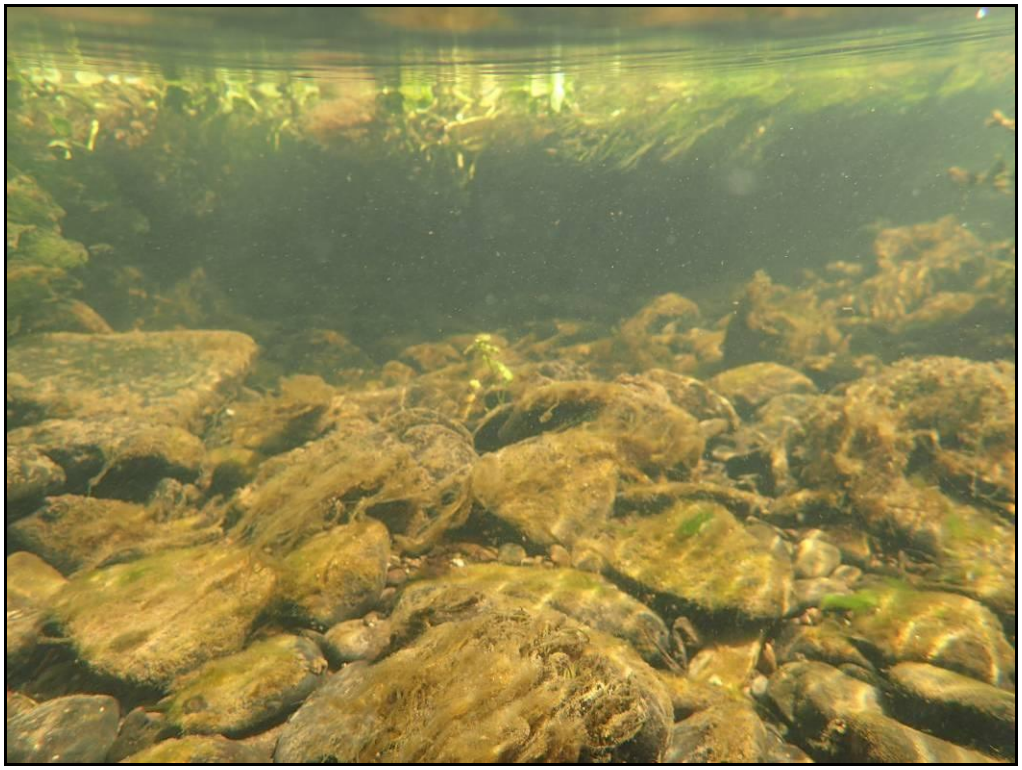

Plate 14 Underwater view of the substrate in the River Finnow at Site 3. Abundant diatom coverage was recorded at this site while filamentous algae was frequent (5-25% coverage).

Plate 15 River Finnow upstream of Wallis's Bridge (Site 3). Submerged macrophyte coverage was 10-25% while aquatic vegetation (emergent and bryophyte) coverage was 1-5%.

Plate 16 Juvenile salmonid recorded in the River Finnow at Site 3.

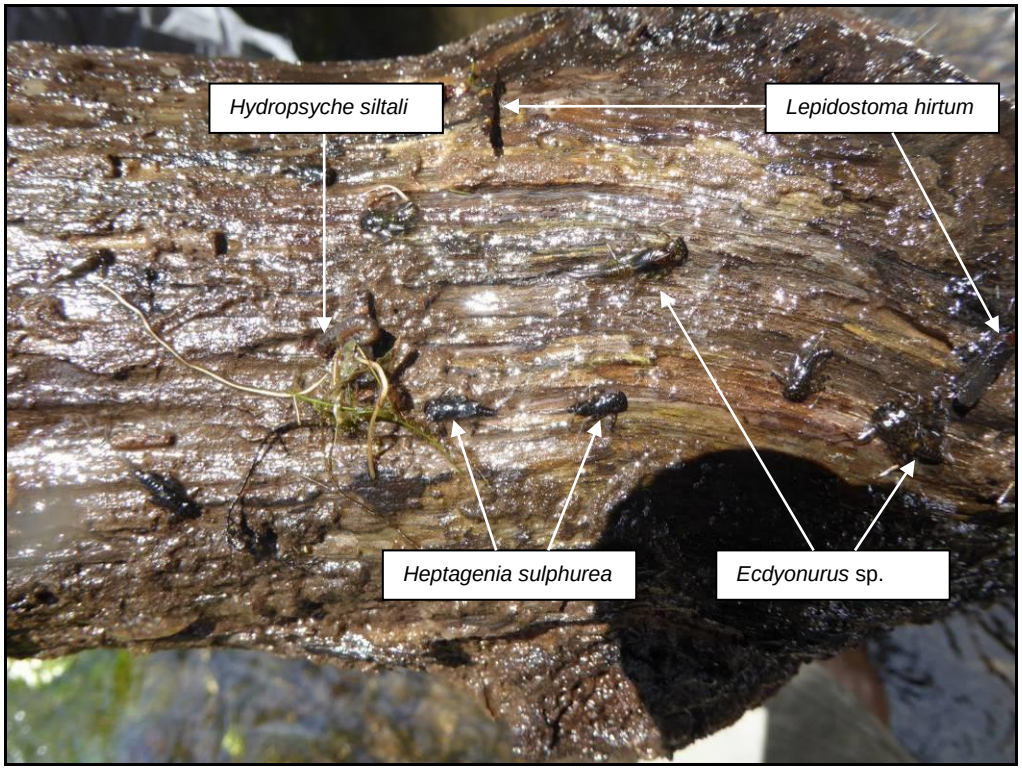

Plate 17 Several species of pollution sensitive macroinvertebrate species were recorded at the four FPM habitat assessment sites including mayfly larvae of *Heptagenia sulphurea* and *Ecdyonurus* sp. Shown above is a log from the River Finnow at Site 4.

Plate 18 Juvenile salmon *Salmo salar* recorded in the River Finnow during kick sampling. The salmonid population in both the Blackwater and Finnow Rivers was considered healthy given the abundance of juveniles.

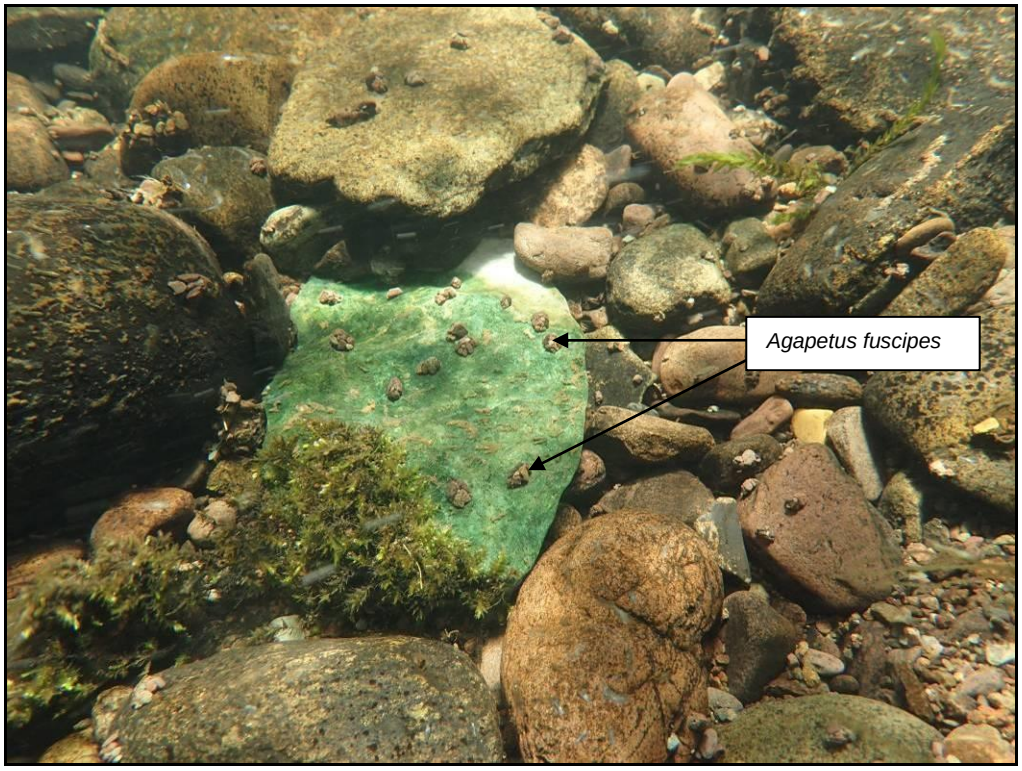

Plate 19 Riverbed of the River Finnow at Site 4. Frequent diatom coverage was recorded here - apparent from the green hue on the white stone. Part of the stone had bryophyte coverage. Cased caddisfly larvae of *Agapetus fuscipes* were common in this river.

Plate 20 Underwater view of the substrate at Site 4 (moderate flow). Filamentous algae and diatoms were occasional and frequent at this site respectively. Some silt was recorded in interstitial spaces at this site, evident from disturbance of the substrate during kick-sampling.

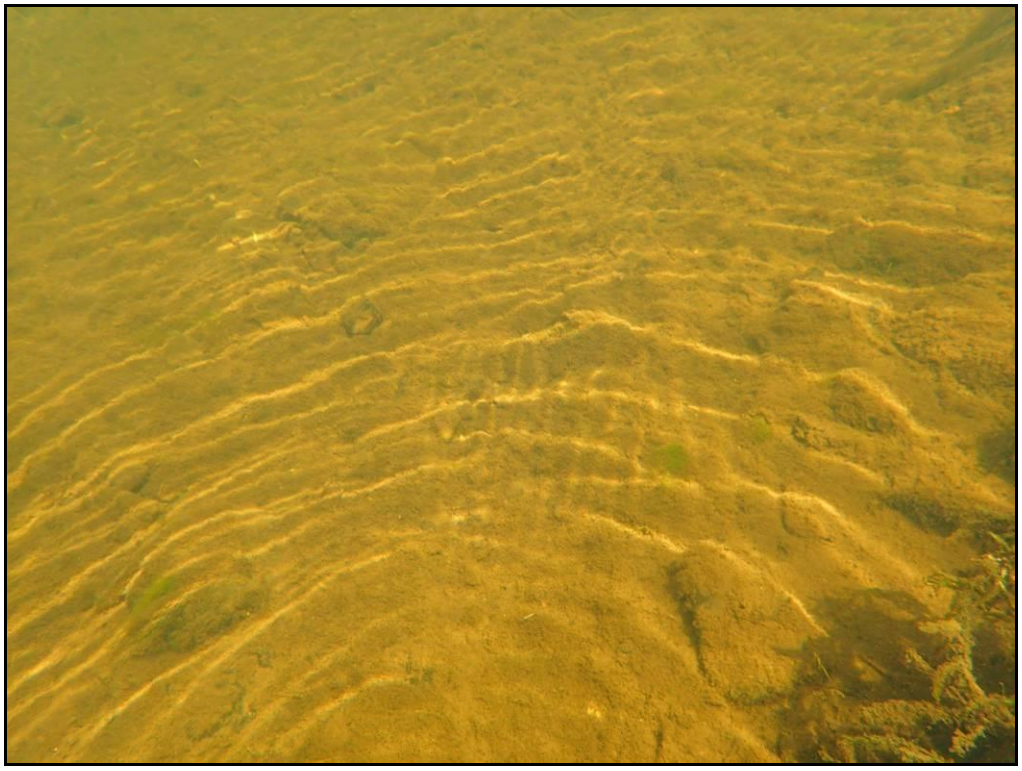

Plate 21 Underwater view of the River Finnow at Site 4 in stationary water. A layer of fine silt is apparent here.

Plate 22 The stretch of the River Finnow at Site 4 had 25-50% submerged macrophyte cover (*Ranunculus* sp.) and approximately 5% emergent vegetation (branched bur-reed *Sparganium erectum*).

Plate 23 Filter feeding Freshwater Pearl Mussels in the Blackwater River upstream of the River Finnow confluence.

Plate 24 Six adult FPM in the Blackwater River upstream of the River Finnow confluence. *Hydra* sp. can be seen here living on these mussels and stretch out their tentacles (cnidae) to capture passing prey.

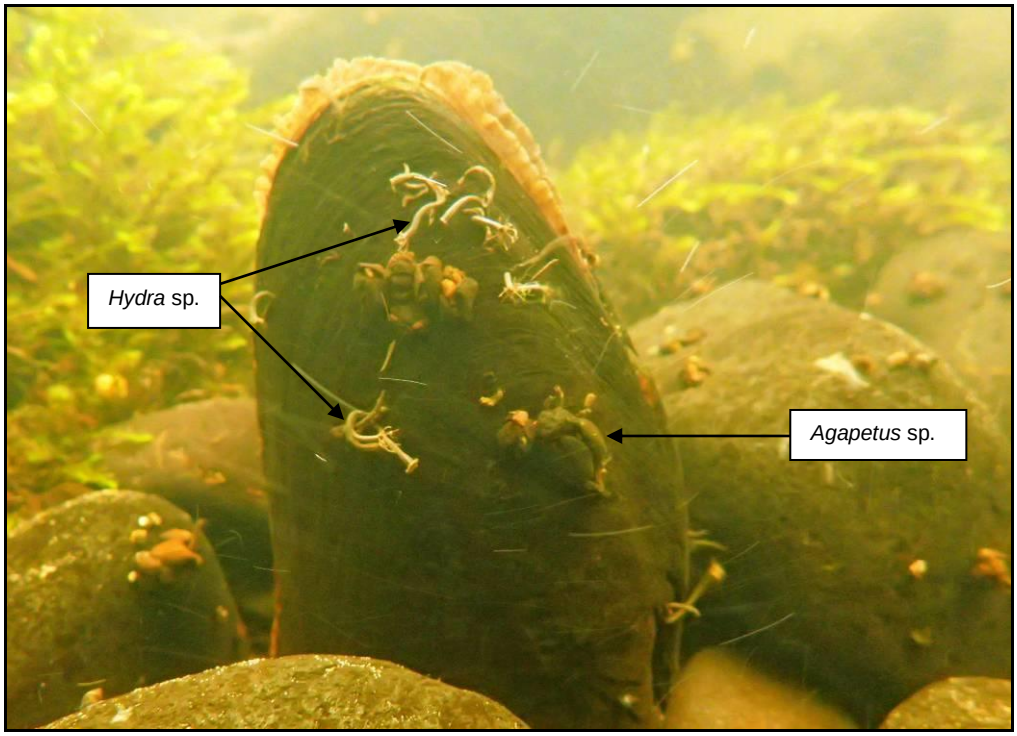

Plate 25 Adult FPM in the River are a habitat for smaller aquatic organisms such as *Hydra* sp. and *Agapetus fuscipes.*

Plate 26 A tree has fallen into the River Finnow approximately 100m upstream of Finnow Bridge. The area under this tree was the only part of Section 1 that could not be surveyed for FPM.

Plate 27 Confluence of Finnow River and Blackwater River.

Plate 28 Disturbed substrate at the left side of the pool in the Blackwater River downstream of the River Finnow confluence.

Plate 29 FPM in the Blackwater River at the junction pool of the Blackwater and Finnow Rivers. It is considered that juvenile FPM could not persist in these conditions owing to sedimentation levels (see previous plate).

Plate 30 Bed of FPM recorded on the left side of the Blackwater River downstream of the Finnow confluence during the Stage 2 survey. The bulk of the FPM population within 1km downstream of the Finnow occur near the left side of the river.

Plate 31 Section of the Blackwater River where all FPM detected were counted (view upstream). The left side of the channel was found to harbour most of the FPM recorded in the stretch of approximately 845m downstream of the River Finnow confluence and most of these were in shaded parts of the river under overhanging trees.

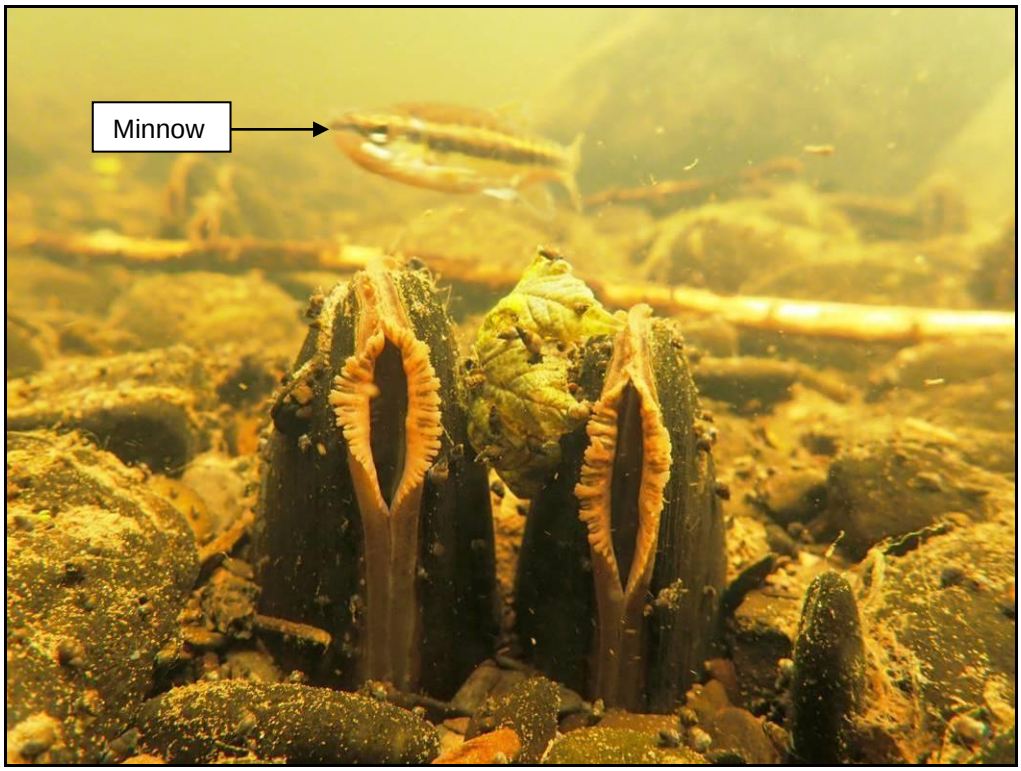

Plate 32 Pair of adult FPM filter feeding in the Blackwater River. With the exception of fast flowing water, Minnow *Phoxinus phoxinus* and FPM largely occupied a similar niche within the river i.e. shallow sluggish areas.

Plate 33 FPM and juvenile salmon recorded during the current survey. The early stage of the life cycle of the FPM is dependent upon salmonids.

Plate 34 Downstream limit of the stretch of approximately 945m of the Blackwater River where the Stage 2 surveyed involved total FPM counts.

Plate 35 Transect 1 - No FPM were recorded here.

Plate 36 Transect 2 - 3 FPM recorded near left bank.

Plate 37 Transect 3 - 2 FPM recorded near left bank.

Plate 38 Transect 4 - 5 FPM recorded near left side of channel.

Plate 39 Transect 5 - 3 FPM recorded at right side of channel.

Plate 40 Transects 6 - 2 Dead shells recorded.

Plate 41 Transect 7 - 11 FPM recorded near left bank.

Plate 42 Transect 8 - 5 FPM recorded: 4 near left bank + 2 mid channel + 1 dead shell.

Plate 43 Transect 9 - 1 FPM mid channel.

Plate 44 Transect 10 - 1 FPM recorded mid channel.

Plate 45 Transect 11 - no FP.

Plate 46 Transect 12 - 1 FPM recorded near left bank + 1 dead shell.

Plate 47 Transect 13 - 1 dead shell.

Plate 48 Transect 14 - 4 FPM: 3 alongside right bank + 1 mid channel.

Plate 49 Transect 15 - no FPM.

Plate 50 Transects 16 - 2 FPM near left bank.

Plate 51 Transect 17 - no FPM.

Plate 52 Transect 18 - no FPM.

Plate 53 Transect 19 - 4 FPM recorded near the middle of the channel.

Plate 54 Transect 20 - 5 FPM recorded at left side of channel.

Plate 55 Bank erosion on River Finnow within the grounds of Drishane Castle following instream works carried out in 2014.

Plate 56 Outfall from the WwTP serving the new development at Drishane Castle.

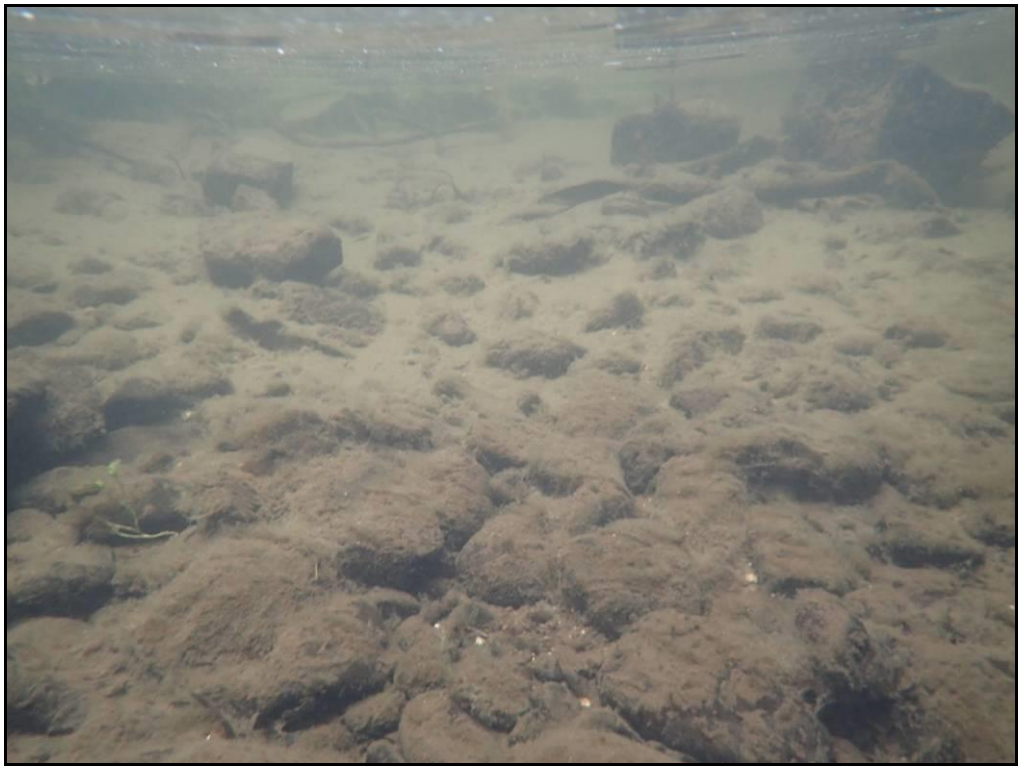

Plate 57 Siltation and sewage fungus in the River Finnow in the vicinity of the outfall from the WwTP with the grounds of Drishane Castle.

APPENDIX 1 Macroinvertebrate sampling results

Table A1.1 Macroinvertebrate species list at 'conditions assessment sites' surveyed on the River Finnow and Blackwater River in June 2015.

	Pollution sensitivity group	Functional group	1	2	3	4
MAYFLIES (Uniramia, Ephemeroptera)						
Heptagenidae						
Autumn dun *Ecdyonurus sp.*	A	Scraper & gathering collector	*			**
Yellow upright *Rhithrogena semicolorata*	A	Scraper & gathering collector	*	*****	****	****
Heptagenia sulphurea	A	Scraper & gathering collector	*****	***	**	***
Ephemerellidae						
Blue-winged olive *Ephemerella ignita*	C	Gathering collector	*****	****	*****	****
Baetidae						
Large dark olive *Baetis rhodani*	C	Scraper & gathering collector	*****	******	******	******
Caenidae						
Anglers Curse *Caenis* sp.	C	Gathering collector	*	***	**	***
STONEFLIES (Order Plecoptera)						
Perlodid stoneflies (Perlodidae)						
Common yellow sally *Isoperla grammatica*	A	Shredder	**	***	**	*
Little yellows and little greens (Chloroperlidae)						
Chloroperla torrentium	A	Shredder	***	**	**	***
CASED CADDIS FLIES (Tricoptera)						
Lepidostomatidae						
Lepidostoma hirtum	B			*		*
Glossosomatidae						
Little black caddisfly *Agapetus fuscipes*	B	Scraper	*****	***	*****	*****
Goeridae						
Silo pallipes	B					*
Primitive caddisflies (Sericostomatidae)						
Black caperer *Sericostoma personatum*	B	Shredder		**		*
CASELESS CADDIS FLIES (Trichoptera)						
Grey flags (Hydropsychidae)						
Hydropsyche siltalai	C	Filtering collector	****	*****	****	****
Green sedges (Rhyacophilidae)						
The sandfly *Rhyacophila dorsalis*	C	Predator	*	*	**	*
Trumpet-net caddisflies (Polycentopodidae)						
Polycentropus sp.	C	Filtering collector			*	*
TRUE FLIES (Diptera)						
Blackfly (Simulidae)	C	Filtering collector		**	****	******
Family Chironomidae						
Green chironomid	C	Filtering collector	**	**	**	*
Ceratopogonidae	C			*	*	
Riffle Beetle larvae (Elmidae)						
Elmis sp.	C	Predator	***	****	****	***
Minute moss beetles (Hydraenidae)						
Hydraena sp.	C	Predator			*	

	Pollution sensitivity group	Functional group	1	2	3	4
SNAILS (Mollusca, Gastropoda)						
Family Lymnaeidae						
Wandering snail *Lymnaea peregra*	D	Shredder				*
Family Hydrobiidae						
Jenkin's spire shell *Potamopyrgus jenkinsi*	C	Scraper	**	****		
Family Ancylidae						
River limpet *Ancylus fluviatilis*	C	Scraper		*	**	***
CRUSTACEANS (Crustacea)						
Amphipods (Amphipoda, Gammaridae)						
Freshwater shrimp *Gammarus duebeni*	C	Shredder	***	*	***	**
Isopods, Asellidae						
Asellus aquaticus	D	Shredder			*	
LEECHES (Hirudinae)						
Erpobdellidae						
Erpobdella testacea	D	Predator			*	
Glossiphonia complanata	D	Predator	*			*
Piscicolidae						
Piscicola geometra	C	Predator			*	
SEGMENTED WORMS (Annelida, Clitellata)						
Aquatic earthworm (Lumbriculidae)	D	Gathering collector			*	
No. of different families	**23**		**14**	**17**	**20**	**21**
Q-value			**4-5**	**4-5**	**4**	**4**
Corresponding WFD status			**High**	**High**	**Good**	**Good**

**Present (1 or 2 individuals), **Scarce/Few (<1%), ***Small Numbers (<5%), ****Fair Numbers (5-10%), *****Common (10-20%), ******Numerous (25-50%), *******Dominant (50-75%), ********Excessive (>75%).*

APPENDIX 2 FPM Field Survey Data

Table A2.1 Bank manager field form for Section 2

BANK MANAGER *Margaritifera* Stage 2 survey FIELD FORM						
River name: Blackwater	River channel section No: 2			Date of survey: June 2015		
County: Cork	Entry point (grid ref.): W28265, 92533			Time of entry: 14:00		
	Exit point (grid ref.): W28907, 93139			Time of exit: 18:00		
Name of bank manager: Eoin McMahon						
Average depth of section: >75cm 50-75cm ✓ <50cm				Width: 20m		
Visibility underwater: >50cm ✓ 30-50cm <30cm						
Weather conditions: Sunny No. Hours sun: 4 No. Hours rain: 0						
Channel subsection	Number of mussels in channel			Number of empty shells in channel		
	Left	Mid	Right	Left	Mid	Right
Subsection 1 length of subsection:	1053	5	154	12	0	6
Subsection 2 length of subsection:						
Subsection 3 length of subsection:						
Subsection 4 length of subsection:						

Table A2.2 Stage 2 survey data sheet for Section 2.

River Name	Blackwater		Hours of Survey	14:00 – 18:00
Catchment	Blackwater		Date of Survey	June 2015
Channel section number (from stage 1 Survey)	2		Name of Surveyors	Gerard Hayes Eoin Connolly Shane O'Toole
Grid Reference of channel entry site	W 28265, 92533		Contact Address	Ecofact, Unit 39, Tait Business Centre, Dominic St., Limerick
Grid Reference of channel exit site	W28907, 93107		License number	
Approximate length of channel surveyed	945m		Visibility underwater	> 50cm (ca. 4m)
Weather conditions	Sunshine (no. hours) 4		Rain (no. hours) 0	
Number of dead shells collected: 2				
Method used (please tick in correct box)	All mussels in 1000m counted ✓		5 x 2m counts made (locations on accompanying maps)	
Total number of living mussels of reproductive age/size	Counted **1456**		Estimate for kilometre section **1541**	
Number of dead shells collected: 18				
Microhabitats in areas where mussels are present (% of each)	Potentially suitable (boulders/gravel/sand) 90%		Unsuitable - bedrock/cobbles 5%	Unsuitable - silt 5%
Microhabitats in areas where mussels are absent, indicate % of each	Potentially suitable (boulders/gravel/sand) 90%		Unsuitable - bedrock/cobbles 5%	Unsuitable - silt 5%
Average width of river	>3m ✓		<3m	
Average depth of river	>75cm	50-75cm ✓	<50cm	
Visibility under-water	>50cm ✓	30-50cm	<30cm	
Bank vegetation	>2m high: 80%	<2m high: 20%	Unvegetated / eroding: 0%	
Water-weed (%)	Where mussels are present 0%		Where mussels are absent 0%	
algae (%)	Where mussels are present 5%		Where mussels are absent 15%	
Salmonids observed	<10cm ✓		>10cm ✓	
Comments	.			

Table A2.3 Bank manager field form for Section 3

BANK MANAGER *Margaritifera* Stage 2 survey FIELD FORM						
River name: Blackwater	River channel section No: 3			Date of survey: June 2015		
County: Cork	Entry point (grid ref.): W28922, 93139			Time of entry: 9:00		
	Exit point (grid ref.): W29875, 93554			Time of exit: 12:00		
Name of bank manager: Eoin McMahon						
Average depth of section: >75cm 50-75cm✓ <50cm				Width: 20m		
Visibility underwater: >50cm✓ 30-50cm <30cm						
Weather conditions: Sunny No. Hours sun: 3 No. Hours rain: 0						
Channel subsection	Number of mussels in channel			Number of empty shells in channel		
	Left	Mid	Right	Left	Mid	Right
Subsection 1 length of subsection:	32	9	16	3	0	0
Subsection 2 length of subsection:						
Subsection 3 length of subsection:						
Subsection 4 length of subsection:						

Table A2.4 Stage 2 survey data sheet Section 3.

River Name	Blackwater		Hours of Survey	9:00 – 12:00
Catchment	Blackwater		Date of Survey	June 2015
Channel section number (from stage 1 Survey)	3		Name of Surveyors	Gerard Hayes Eoin Connolly Shane O'Toole
Grid Reference of channel entry site	W28922, 93139		Contact Address	Ecofact, Unit 39, Tait Business Centre, Dominic St., Limerick
Grid Reference of channel exit site	W29875, 93554		License number	
Approximate length of channel surveyed	1.155m		Visibility underwater	> 50cm (ca. 4m)
Weather conditions	Sunshine (no. hours) 3		Rain (no. hours) 0	
Number of dead shells collected: 2				
Method used (please tick in correct box)	All mussels in 1000m counted		20 x 4m counts made (locations on accompanying maps) ✓	
Total number of living mussels of reproductive age/size	Counted **57**		Estimate for kilometre section **713**	
Number of dead shells collected: 5				
Microhabitats in areas where mussels are present (% of each)	Potentially suitable (boulders/gravel/sand) 90%		Unsuitable - bedrock/cobbles 5%	Unsuitable - silt 5%
Microhabitats in areas where mussels are absent, indicate % of each	Potentially suitable (boulders/gravel/sand) 90%		Unsuitable - bedrock/cobbles 5%	Unsuitable - silt 5%
Average width of river	>3m ✓		<3m	
Average depth of river	>75cm	50-75cm ✓	<50cm	
Visibility under-water	>50cm ✓	30-50cm	<30cm	
Bank vegetation	>2m high: 80%	<2m high: 20%	Unvegetated / eroding: 0%	
Water-weed (%)	Where mussels are present 5%		Where mussels are absent 10%	
algae (%)	Where mussels are present 5%		Where mussels are absent 15%	
Salmonids observed	<10cm ✓		>10cm ✓	
Comments	.			

Table A2.1 Stage 1 Survey Data Sheet for Section 1 (River Finnow)

River Name	Finnow	Hours of Survey	2.5
Catchment	Blackwater	Date of Survey	June 2015
Channel Section	1	Name of Surveyor	Gerard O'Neill Eoin Connolly Shane O'Toole
Grid reference of start of channel	W127848, 95198	Contact Address	ECOFACT, Unit 36, The Tait Business Centre, Dominic St, Limerick
Grid reference of start of channel	W128384, 92532	Current License	
Weather conditions	Sunshine (No. Hours)	Rain (No. Hours)	
Mussel population	1 Abundant 2 Present	3 Dead shells only	4 No evidence ✓
Number of dead shells collected	0		
Microhabitats in stretches where mussels are present, indicate % of each	Potentially suitable (boulders/gravel/sand) -	Unsuitable - bedrock/cobbles -	Unsuitable -silt -
Microhabitats in stretches where mussels are absent, indicate % of each	Potentially suitable (boulders/gravel/sand) 80 %	Unsuitable - bedrock/cobbles 15%	Unsuitable -silt 5%
Average width of river (please tick)	>3m ✓	<3m	

Additional Ecological Surveys
on the
River Finnow at Millstreet

March 2016

A Report Prepared for a Revised Design of the Millstreet Wastewater Treatment Plant on behalf of Mott McDonald

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TABLE OF CONTENTS

1. INTRODUCTION

ECOFACT Environmental Consultants Ltd. was commissioned by Mott MacDonald to undertake environmental surveys for the proposed upgraded Millstreet Waste Water Treatment (WwTP). These surveys follow on from previous surveys that were based on a proposed discharge from the upgraded plant to the River Finnow (EPA code 18F03) near the confluence of the Millstreet 18 / Tanyard Stream (EPA code 18M43). It is currently intended to discharge from the proposed upgraded Millstreet WwTP) to the River Finnow at Finnow Bridge, located approximately 1.7km upstream of the Tanyard Stream confluence. The River Finnow is a 4th order tributary of the Blackwater [Muster] River (EPA code 18B02). Ecofact carried out a Freshwater Pearl Mussel (*Margaritifera margaritifera*) survey of the lower reaches of the Finnow River and on the Blackwater under licence C16 / 2015 in 2015. Freshwater Pearl Mussel (FPM) were not recorded in the River Finnow at this time, where the surveyed stretch was from c. 100m upstream of the Tanyard Stream confluence to the main channel of the Blackwater River. During the 2015 survey, a significant number of FPM were found in the stretch of the Blackwater River from approximately 100m upstream of the River Finnow confluence to 350m downstream of Keale Bridge, the nearest bridge on the Blackwater downstream of the Finnow confluence. The current surveys comprised an Otter *Lutra lutra* survey, a Freshwater Pearl Mussel survey, and a bat survey.

The otter is a species of conservation concern and high priority having suffered major declines in its range and population throughout Europe. It is classified as 'near threatened' by the IUCN Red List with a decreasing population trend and, as such, is listed in Appendix 1 of CITES, Appendix II of the Bern Convention (Council of Europe, 1979) and Annexes II and IV of the EC Habitats Directive (92/43/EEC). It is also an offence under national legislation (Wildlife Act 1976, Wildlife (Amendment) Act 2000) to hunt, disturb or intentionally kill otters.

The Freshwater Pearl Mussel (FPM) is a protected species listed on Annex II of the EU Habitats Directive (1992).The Blackwater River is designated as an SAC for its significant conservation importance with regard to the FPM, in addition to a number of other Annex II species and Annex I habitats. There is no evidence in the literature that a detailed FPM survey has been carried out in the stretch of the River Finnow from Finnow Bridge to the Tanyard Stream confluence. There is a FPM record from the River Finnow at Inchileigh Bridge approximately 2.2km upstream of Finnow Bridge. At this location, FPM were recorded in 1987 by J. Lucey but upon validation by E. Moorkens, only dead shells were found. Due to the protected status of the Freshwater Pearl mussel, qualified surveyors with a licence from the National Parks and Wildlife Service (NPWS) were required to undertake a survey of the River Finnow from Finnow Bridge to the Tanyard Stream confluence as this watercourse could potentially be affected by the proposed Millstreet WwTP. ECOFACT applied for and were issued a licence (NPWS Licence No. C037 / 2016) to carry out this work. This report details the type and extent of the surveys carried out and the results obtained.

All bat species are protected under the Wildlife Act (1976) and Wildlife [Amendment] Act (2000) which make it an offence to wilfully interfere with or destroy the breeding or resting place of these species; however, the Acts permit limited exemptions for certain kinds of development. In view of their sensitive status across Europe, all species of bat have been listed on Annex IV of the EC 'Habitats and Species Directive' and some, such as the lesser horseshoe bat, are given further protection and listed on Annex II of this Directive. This Directive was transposed into Irish law as the European Communities (Natural Habitats) Regulations, 1997 and ensures that individual bats and their breeding sites and resting places are fully protected. This has important implications for those who own or manage sites where bats occur.

2. METHODOLOGY

Methodology for the Otter, Bat and FPM surveys are outlined below. Figure 1 gives the locations of these surveys.

2.1 Otter survey

The boundary of the area requiring an otter survey was provided by Mott MacDonald. Survey methodology followed that outlined in *Monitoring the Otter Lutra lutra* (Chanin, 2003). In summary, signs of otter were sought within the boundary of the site and immediate environs. The survey was undertaken during March 2016 after a period of at least five days without rain before the survey. The following were recorded: presence or absence of otter signs and the number of otter spraints in three categories (dried fragmented, dried intact; not fully dry). Equipment used in the survey was as follows: thigh waders, wading stick, high visibility vest, buoyancy aid, digital camera, GPS, binoculars and torch (for searching in culverts and bridge arches). Signs of otter were sought during the survey by ecologists with sufficient experience to be able to confidently find and identify signs. Signs of otters include spraints, couches, holts, footprints and feeding remains.

Otters' droppings (spraints) are used to mark their territories, usually at noticeable points such as on rocks or high mounds, called 'seats'. These locations are generally important fishing or grooming sites e.g. floor of bridges, saddle of overhanging bankside trees or in-channel rocks. The primary technique used for detecting the presence of otters was to search for spraints. The presence or absence of otters was recorded.

As otter footprints are very distinct, they were used as evidence of otters, which use signs to indicate only presence or absence of otters.

Categories of footprint sizes used to identify otters are listed in (Chanin, 2003) as follows:

- Large prints = males;
- Medium sized prints = females or sub-adult males; and
- Small prints = juveniles.

Otters also rest above ground in specially constructed couches. These are often found on islands or in dense cover. Otters use chutes in mud, termed slides, to slip into the water. Otters dig burrows in or near the riverbank called holts where they rest during the day. High, sloping, wooded banks above flood level often provide good root-system holts for otters. Any otter tracks were followed insofar as possible to find holts if present within the study area and immediate environs.

2.2 Bat survey

A daytime bat survey of Finnow Bridge was carried out during March 2016. A torch was used to view crevices and other spaces potentially used by resting bats. Potential roosting sites such as narrow gaps behind pipes and mortar and thickets of ivy were also examined. These investigations were assisted by the use of a borescope. Special attention was given to looking for bat droppings on flat or near flat surfaces in the vicinity of the bridge i.e. ledges and pipes. A BatBox heterodyne detector was also used during this survey as bats sometimes emit signals during the daytime. In assessing features for bats, the NPWS Wildlife Manual No. 25 '*Bat Mitigation Guidelines for Ireland*' by Kelliher and

Marnell (2006) and National Roads Authority *Guidelines for the Treatment of Bats Prior to the Construction of National Road Schemes* (NRA, 2005) were acknowledged.

The bridge grading system established by Billington and Norman (1997) was utilised to rate the bridge as follows:

0 = no potential (no suitable crevices)
1 = crevices present may be of use to bats
2 = crevices ideal for bats but no evidence of usage
3 = evidence of bats (e.g. bat present, droppings etc.)

Billington & Norman (1997) consider that any crevice greater that 100mm deep and sheltered from the elements should be regarded as a potential bat roost.

The trees in the vicinity of the bridge were examined from the ground in daylight to assess their importance for bat roosting and foraging. Each tree was visually examined in for bats, signs of bats or evidence bat activity. Tight crevices between ivy and the bark of the trees, including splits and cracks were examined.

2.3 Freshwater Pearl Mussel survey

The Freshwater Pearl Mussel (FPM) survey on the River Finnow comprised a Stage 1/2 visual examination. This survey was undertaken during March 2016 under licence No. C037/2016. Surveying for FPM was carried out following the NPWS guidance '*Margaritifera margaritifera Stage 1 and Stage 2 survey guidelines. Irish Wildlife Manuals, No. 12'* (Anon, 2004).

The River Finnow from approximately 50m upstream of Finnow Bridge to the confluence with the Tanyard Stream confluence, corresponding to a channel length of ca 1.74km, was subject to a Stage 1 presence - absence survey. This survey involved wading in the river viewing the substrate with the aid of a bathyscope. The entire channel was not examined, instead transects were selected approximately 50m apart where a section of river of length ca. 4m was inspected in detail. Transects were selected in accessible areas with water depth also considered. Transect locations were recorded by GPS (see Figure 2). The river was also inspected longitudinally by two ecologists between transects, again where depth allowed. Depositing areas along the surveyed stretch were checked for the presence of dead shells. Empty dead shells found were removed from the river. All live FPM and FPM shells were recorded by quantity and location (using GPS). FPM and river substrates were photographed.

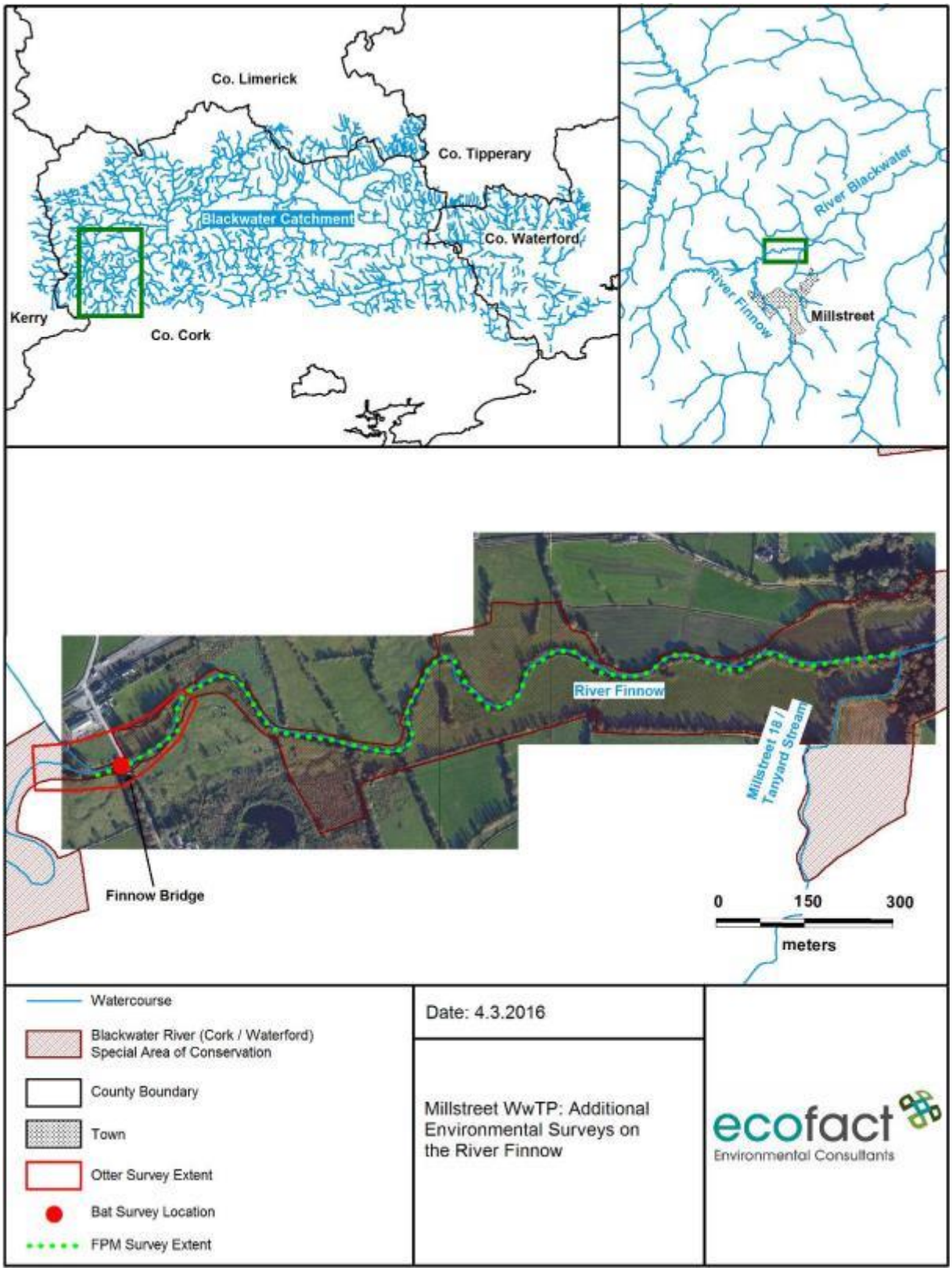

Figure 1 Location / extent of Otter, and and FPM surveys carried out on the River Finnow in March 2016.

3 RESULTS

3.1 Otter survey

The current survey was undertaken during excellent weather conditions for an Otter survey. There was no recent rainfall i.e. within 5 days which allowed signs of Otter to be detected.

The Otter survey study area (in the environs of Finnow Bridge) does not contain an Otter holt. This part of the river is frequented by Otter however as three instances of sprainting was recorded. The locations of the spraints are shown in Figure 3. Two of these spraints occurred immediately adjacent to the bridge and were classified as *not fully dry*. Another spraint approximately 400m upstream of the bridge on the right side of the river was *dried and fragmented*, indicating it had been deposited some time before the spraints at the bridge. Otter footprints were found in a number of locations on the right bank of the river. Two different sized footprints were found; one set was large (corresponding to an adult male) and another set was medium (corresponding to a female / sub-adult male). Therefore, the current Otter survey suggests that Otter are active within the study area but are not using the environs of the bridge as a breeding location.

3.2 Bat survey

Finnow Bridge comprises three arches and is of mixed construction (old stone bridge augmented with more modern construction methods of steel and concrete). This survey did not indicate the presence of bats or previous bat usage within Finnow Bridge. Crevices and recesses deemed suitable for bat resting were present in the stonework and cracks in concrete under the bridge. Detailed examination of these crevices did not reveal the presence of bats either directly through sightings or indirectly through the presence of droppings on ledges or pipes. No signals of bats were recorded by the BatBox heterodyne detector.

Although no evidence of bats was recorded during the survey a number of suitable crevices were more than 100m deep. Using the bridge grading system developed by Billington and Norman (1997) Finnow Bridge was rated grade '2' i.e. crevices ideal for bats but no evidence of usage.

Trees in the vicinity of the bridge provided a suitable foraging / commuting corridor habitat for bats. In particular, a row of mature trees adjacent to a drainage channel perpendicular to the River Finnow on the upstream side of the Finnow Bridge provides optimal foraging habitat (see Figure 3). A number of mature trees downstream of the Finnow Bridge are covered in ivy and while access prohibited close examination of these trees they were deemed suitable for roosting bats.

3.3 FPM survey

The current survey was undertaken with clear to low cloud cover. Normal flow conditions were present in the River Finnow following a period of dry weather. Clarity in the River Finnow was optimal for a FPM survey with clear water. FPM field survey data sheets are provided in Appendix 2.

The surveyed stretch of the River Finnow was from approximately 50m upstream of Finnow Bridge to the Tanyard Stream confluence, a channel length of ca. 1.74km. This stretch of river was subject to a Stage 1 survey to determine the presence / absence of FPM. Neither live FPM nor empty dead shells of FPM were encountered during this survey. All transect locations indicated in Figure 2 were

completely checked. Additionally, no FPM were recorded in any part of the channel between transects, where most of the river was viewed by two surveyors when walking between transects. The occurrence of live FPM in this part of the river is considered unlikely.

4. Discussion

The current survey comprised a Freshwater Pearl Mussel survey, Otter *Lutra lutra* survey and bat survey.

An Otter survey was conducted in area reaching from approximately 150m upstream of Finnow Bridge to 150m downstream of Finnow Bridge. Spraints and tracks which indicated the presence of Otter were found on the left bank facing upstream of the Finnow Bridge. Tracks, which were probably of an adult male, were discovered immediately adjacent the Finnow Bridge. Spraints, which were still moist and intact, indicating their relative freshness, were discovered on tussocks of grass within 5m of these tracks. Further upstream on the same bank tracks were discovered in a deposit of sand on the bank which eventually lead into the water. These tracks were smaller than those recorded adjacent to the Finnow Bridge and are considered to be that of female or sub-adult male. A spraint was also found near these tracks. This spraint was relatively dry and not intact suggesting it was not freshly laid.

The FPM survey consisted of a total of 27 transects beginning approximately 50m upstream of Finnow Bridge and ending adjacent to the confluence with the Tanyard Stream covering a distance of approximately 1.7km. Neither live FPM nor dead shells were recorded throughout the survey. It is noted that substrate conditions in the surveyed stretch of the river were unfavourable with respect to FPM, and especially juveniles. This was due to the presence of deeply embedded silt. Another apparent water quality issue recorded was that of eutrophication, as evident by luxuriant filamentous algal growth indicative of nutrient enrichment. The degree of siltation following an unusually wet winter and algal growth at such an early stage of the year highlight catchment wide problems for the River Finnow. Excessive bank erosion as well as gravel abstraction was also recorded along the surveyed stretch of river, additional pressures for FPM in the Blackwater catchment.

A daytime bat survey was conducted at the Finnow Bridge and its environs. A number of crevices and cracks which were over 100mm deep were discovered in the structure of the bridge and these were deemed suitable for roosting bats. However, no roosting bats or signs of roosting bats, such as droppings, were discovered during the survey. A treeline running perpendicular to the River Finnow immediately upstream of the Finnow Bridge provides a suitable corridor for foraging bats.

In conclusion; the most significant findings of the surveys conducted was the presence of Otter, an Annex I species, within the immediate vicinity of the Finnow Bridge. The absence of evidence of FPM from the surveyed stretch of the River Finnow is also notable givven their presence in the River Blackwater into which the Finnow flows. Although no bats or signs of bats were recorded at Finnow Bridge it was deemed suitable for roosting bats and may be used by them during the summer months.

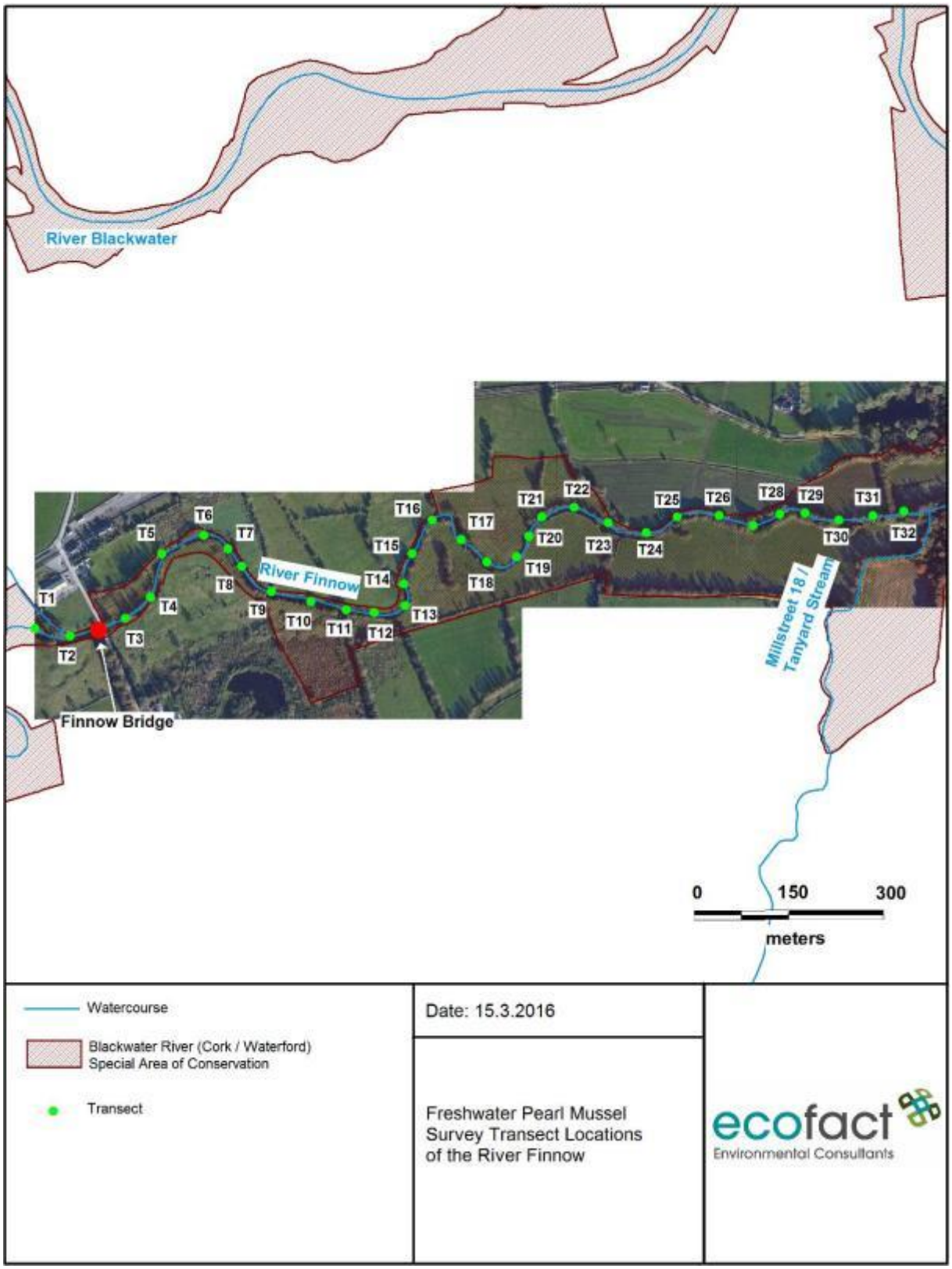

Figure 2 Freshwater Pearl Mussel transects on the surveyed stretch of the River Finnow.

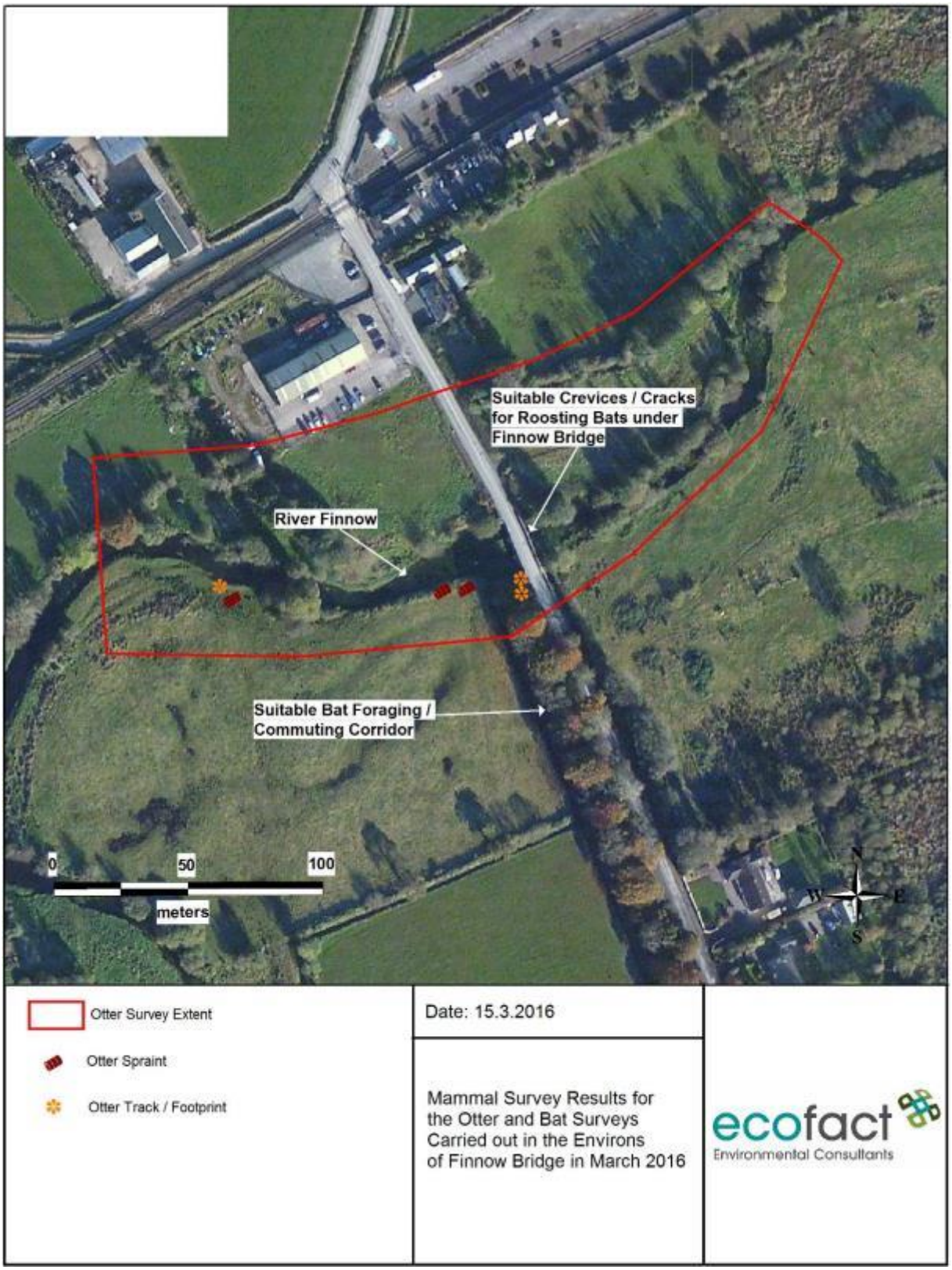

Figure 3 Faunal Ecology map of the immediate vicinity of the Finnow Bridge.

5. Recommendations

If any works are proposed on the bridge as part of the Millstreet WwTP and drainage upgrade during the period March to October inclusive, it is recommended that a bat emergence survey be carried out to establish if bats are using the bridge for roosting. This work should be timed as closely as possible in advance of proposed works. This emergence survey should be carried out by ecologists with appropriate experience. If bats are found to be using the bridge following the emergence survey, the local NPWS ranger will be contacted and informed. Works on a known bat roost is a notifiable action under current legislation and a derogation licence has to be obtained from the Department of Arts, Heritage and Gaeltacht before works can commence. It an offence to wilfully interfere with any structure or place used for breeding or resting by a bat, wilfully interfere with a bat while it is occupying a structure or place which it uses for that purpose.

If bats are not detected during an emergence survey, works could proceed but in the event that bats are encountered at any time during the proposed works, the Bat Helpline (1800 405 000) will be contacted for advice before further works take place.

REFERENCES

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Chanin P (2003). *Monitoring the Otter Lutra lutra. Conserving Natura 2000 Rivers Monitoring Series No. 10*. English Nature, Peterborough.

Kelleher, C. & Marnell, F. (2006) *Bat Mitigation Guidelines for Ireland. Irish Wildlife Manuals, No. 25*. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.

NRA (2005) *Guidelines for the Treatment of Bats Prior to the Construction of National Road Schemes*. National Roads Authority.

PLATES

Plate 1 Upstream view of the River Finnow from Finnow Bridge. Riparian areas along this stretch of river were check for signs of Otter.

Plate 2 Otter Spraints were identified on tussocks of grass on the right bank on the River Finnow upstream of Finnow Bridge.

Plate 3 Otter Spraint on a high tussock of grass indicating a territorial mark. This spraint was intact and slightly moist indicating that it was relatively fresh.

Plate 4 Otter tracks immediately adjacent to Finnow Bridge. These prints were within 5m of two spraints. This footprint was relatively large and was probably imprinted by an adult male.

Plate 5 Otter spraints and tracks were also identified at this location approximately 100m upstream of Finnow Bridge.

Plate 6 Otter spraints at the upstream limit of the study area. This spraint was dry and disintegrated indicating it was an old deposit.

Plate 7 Otter tracks at the upstream limit of the Otter survey study area. These tracks were smaller than the track identified near the Finnow Bridge and probably belong to a female or sub-adult male.

Plate 8 A borescope was used to investigate the crevices and cracks for any signs of roosting bats. No such evidence was found in any part of Finnow Bridge however.

Plate 9 Upstream face of Finnow Bridge. This aspect of the bridge has no potential to be used by bats but the underside of the arches had crevices that could be used by bats for roosting.

Plate 10 The downstream face of Finnow Birdge. Finnow Bridge has a number of crevices and cracks that were deemed suitable for resting bats.

Plate 11 Crevices on the right arch of Finnow Bridge and a structural crack would provide potential habitat for roosting bats. However, no bats, bat droppings or other signs of bats were recorded during the survey.

Plate 12 Stonework on the arches of the Finnow Bridge provided suboptimal roosting conditions for bats.

Plate 13 The FPM survey was conducted using wading and bathyscopes. Each transect was surveyed in its entirety. No live FPM or dead shells were recorded during the survey.

Plate 14 FPM transect 1 was located upstream of Finnow Bridge. Weather conditions and water level were ideal for the FPM survey.

Plate 15 Bank erosion was constant feature throughout the length of the surveyed stretch. Bank reinforcement works are shown above.

Plate 16 A mound of gravel which appeared to have been abstracted from the riverbed of the adjacent stretch of the River Finnow. This activity is listed as a pressure for FPM in the Blackwater River catchment.

Plate 17 The substrate largely consisted of cobbles throughout the survey with patches dominated by finer sediments such as gravels and sands. Levels of silt were considerable throughout the survey stretch.

Plate 18 Filamentous algal cover was high in the River Finnow especially considering the time of the survey. This plant indicates eutrophication.

APPENDIX 1 FPM Field Survey Data

Table A1.1 Stage 1 Survey Data Sheet for the River Finnow.

River Name	Finnow	Hours of Survey	5
Catchment	Blackwater	Date of Survey	March 2016
Channel Section	1	Name of Surveyors	Gerard Hayes William O'Connor
Grid reference of start of channel	W126595, 92034	Contact Address	ECOFACT, Unit 36, Tait Business Centre, Dominic St, Limerick
Grid reference of end of channel	W27957, 92194	Current License	
Weather conditions	Sunshine (No. Hours) 5	Rain (No. Hours) 0	
Mussel population	1 Abundant 2 Present 3 Dead shells only 4 No evidence ✓		
Number of dead shells collected	0		
Microhabitats in stretches where mussels are present, indicate % of each	Potentially suitable (boulders/gravel/sand) -	Unsuitable - bedrock/cobbles -	Unsuitable -silt -
Microhabitats in stretches where mussels are absent, indicate % of each	Potentially suitable (boulders/gravel/sand) 80 %	Unsuitable - bedrock/cobbles 15%	Unsuitable -silt 5%
Average width of river (please tick)	>3m ✓	<3m	

MOTT MACDONALD

Millstreet WwTP Upgrade

Invasive Species Survey

6 October 2016

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Millstreet WwTP Upgrade

Invasive Species Survey

6 October 2016

Irish Water

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	05/10/2016	R Mansfield	F McGivern	F McGivern	For Issue

Information class: Standard

Contents

1 Introduction

Mott MacDonald Ireland Ltd. was engaged by Irish Water for the Milstreet WwTP Upgrade. This scheme comprises upgrading of the wastewater treatment plant in Millstreet together withteh relocation fo the outfall into the Finnow River at Finnow Bridge.

An Invasive Species Survey of the Milstreet WwTP Upgrade was carried out on 06th October 2016 by Rita Mansfield, Senior Ecologist with Mott MacDonald.

The objective of the survey was to:

- identify the presence of invasive species within the survey area;
- undertake an assessment of the potential impacts on the Millstreet WwTP Upgrade works from invasive species observed during field assessment; and
- make recommendations for further surveys and mitigation measures as appropriate.

This report has been prepared to inform the final design and construction methodology of the Millstreet WwTP Upgrade relative to potential impacts of Invasive Species.

1.1 Invasive Species

The works associated with the Millstreet WwTP Upgrade will be located within the empty plot located to the north of the existing waste water treatment plant and also along Station Road and at the Finnow Bridge. Works will involve excavating areas of road pavement, grass verges, amenity grassland, river banks and river bed. Such areas have a high level of anthropogenic activity and as such are often vulnerable to the establishment of invasive species.

Invasive Species Ireland (http://invasivespeciesireland.com/) identifies invasive species as plants and animals that have been introduced, deliberately or accidentally, by humans and have a negative impact on the economy, wildlife or habitats of Ireland and Northern Ireland. Such species are defined in national law through the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended) (S.I. No. 477 of 2011).

It is an offence under Regulation 49 of the Regulations, to plant, disperse, allow or cause to disperse, spread or otherwise cause to grow any plant specified in the Third Schedule of the Regulations. Similarly it is an offence to release or allow / cause to disperse any animal in the Third Schedule of the Regulations. Vector material which is subject to Regulation 49 is also defined as soil or spoil taken from places infested with Japanese knotweed *(Fallopia japonica), giant knotweed (Fallopia sachalinensis) or their hybrid Bohemian knotweed (Fallopia x bohemica).*

2 Methodology

2.1 Desktop Study

A desktop study of the footprint of the Millstreet WwTP Upgrade was carried out prior to the site visit. A review of the invasive species data from the National Biodiversity Data Centre identified the following invasive plant and animal species in the 2km grid (W29R and W29Q) encompassing the Millstreet WwTP Upgrade:

Table 1: Documented Invasive Species in Millstreet

Scientific name	Common name	Date of last record	Location	Designation
Gunnera tinctoria	Giant-rhubarb	10/05/2006	Inchileigh Bridge	High Impact Invasive Species
Cervus nippon	Sika Deer	31/12/2008	Not recorded	High Impact Invasive Species
Fallopia japonica	Japanese Knotweed	15/07/2009	Wallis's Bridge	High Impact Invasive Species

Source: NBDC

2.2 Field Assessment

An invasive species walkover survey of the Millstreet WwTP Upgrade was carried out on the 06th October 2016 by Rita Mansfield, Senior Ecologist with Mott MacDonald. The scope of the survey included the footprint of the scheme plus a 20m buffer (where feasible). Landowners were contacted prior to accessing private lands.

Survey of the outfall pipe location on the Finnow River and the storm pipe location of the Tannyard Stream included the riparian habitat plus the watercourse itself such that terrestrial and freshwater invasive species were searched for.

Where large stands of invasive plants were encountered, the length and width of the stand was recorded and estimation was made of how recently the vegetation had established. Where feasible the abundance of the infestation (density of plants per m^2 or number of individuals) was determined

The habitat type in which the invasive species was recorded was noted as well as the habitat type in the wider environment.

Any evidence of disturbance was also noted.

Where existing management measures (e.g. effects of herbicide spray) were observed, these were also noted.

The scope of this invasive species survey included all species listed on the Third Schedule of the European Communities (Birds and Natural Habitats) Regulations 2011 (as amended).

Equipment used for the survey included digital camera, field recording sheets including base maps for annotation in the field, mapped overview of the Millstreet WwTP Upgrade and field guides to assist with species identification.

Weather conditions on the day of the survey were dry with light winds.

3 Results

Dense stands of Japanese knotweed were observed along the northern bank of the River Finnow immediately upstream of the bridge. These stands are well established (stem heights >2.5m) and are located along the riparian area of the River Finnow. The bank is steeply sloping at this location. The extensive stand of knotweed is intermittently broken by willow scrub. The stand at the bridge is approximately 3m wide and 15m in length along the river bank. Subsequent upstream stands are of a similar size.

The wider environment is dominated by improved agricultural grassland. Japanese knotweed was also observed in the adjacent field in an area of disturbed ground and dumped spoil material. It is likely that this material is the source of the infestation.

There is no evidence of attempts to control the infestation.

The outfall pipe to the river Finnow is proposed to discharge at the opposite bank of the river. There was no evidence of knotweed at this location. It is of note however that this river bank is used by anglers to access the watercourse.

Figure 1: Japanese Knotweed, Finnow Bridge

Source: Taken 06/10/2016

Figure 2: Japanese Knotweed, Finnow Bridge

Source: Taken 06/10/2016

4 Recommendation

4.1 General

Japanese knotweed was observed only on the northern bank of the River Finnow, upstream of the bridge. It is intended that the outfall pipe from the WwTP discharges to the River Finnow upstream of the bridge at the opposite bank. The outfall pipe will extend into the watercourse. There is potential for instream works to disturb the stands of knotweed on the opposite bank.

Mitigation is prescribed to **prevent the spread** of Japanese Knotweed in association with the Millstreet WwTP upgrade works. Mitigation is prescribed with regard to:

- Environment Agency (2006, updated 2013) Managing Japanese knotweed on development sites: the knotweed code of practice.
- Irish Water (2016) Information and Guidance Document on Japanese knotweed Asset Strategy and Sustainability. Rev 1.0. IW-AMT-SOP-009

4.2 Isolation of the Infested Area from the Works Area

Immediately in advance of construction the site must be re-surveyed in order to determine the full extent of the knotweed infestation, including the extent of rhizome growth, and also whether there are any new areas of growth, within and immediately adjacent to Works areas. In the event that the survey identifies Japanese Knotweed within the works areas, an invasive species management plan must be developed and implemented on site.

The works area must be delineated such that vehicles and pedestrians are prevented from accessing any areas of Japanese Knotweed growth.

A dedicated footwear & vehicular wheel wash facility will be provided adjacent to the outfall works area. Collected washings will be disposed of under licence to a facility certified for disposal of Japanese Knotweed.

All site staff must be inducted and made fully aware of the Japanese Knotweed infestation and associated work requirements.

5 References

Environment Agency (2006, updated 2013) Managing Japanese knotweedon development sites: the knotweed code of practice.

Irish Water (2016) Information and Guidance Document on Japanese knotweed Asset Strategy and Sustainability. Rev 1.0. IW-AMT-SOP-009