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30/08/2010

**Re: Notices in accordance with Regulation 18(3)(b) of the Waste Water  
Discharge**  
**(Authorisation) Regulations 2007)**

**D0204-01**

Dear Ms. O'Callaghan,

Your notices dated 30<sup>th</sup> April last and previous correspondence regarding the following Waste Water Discharge Licence applications refer.

Reg No.	Agglomeration Name	Date of Application
D0204-01	Charleville	06/10/2008
D0444-01	Churchtown	22/06/2009

I enclose screening assessments for the above agglomerations as per correspondence of 31<sup>st</sup> May last. In relation to the agglomerations discharging to the Blackwater SAC or directly to other SACs in the catchment thereof it is the intention of Cork Co Co to procure the services of a consultant to prepare an Appropriate Assessment of the impact of these discharges.

I expect that the tender for the Preparation of the Appropriate Assessments will be advertised in late Autumn and a consultant appointed by the end of the year. At that stage I would expect Cork Co. Council will be in a position to give a definite timeframe for the submittal of the Appropriate Assessments.

Yours truly,

Paddy O' Friel  
Substitute Senior Engineer  
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**Habitats Directive Assessment (Screening Report) in respect of**

**Application by Cork County Council to the EPA**

**for discharge license in respect of the**

**Charleville Waste Water Treatment Plant.**

**August, 2010**

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## 1 Introduction

1.1 The Charleville WWTP is located in the townland of Ballincolly to the North east of Charleville (Grid reference; 154060E, 124412N).

The WWTP was constructed in 1982 to treat waste for a 7500 population equivalent. Current figures indicate the plant is treating waste of a PE of 3696 approximate. The discharged waste is in compliance with the Urban Wastewater Treatment Regulations. The treated waste discharges into the Charleville Stream (also known as the Glen River) at the Eastern Boundary of the Site circa 3.5 km upstream of the confluence with the River Maiguy which flows to the River Shannon Estuary.

Flow to the WWTP is directed to an inlet flume which contains a storm water overflow (During peak storm event, flows in excess of 6DWF overflow directly into the Charleville stream). This is followed by screening (mechanical with manual bypass) and onto a splitter chamber.

The flow is directed into one of two oxidation ditches (the idle oxidation ditch is currently used as a lagoon for leechate which is drip fed into the treatment stream). Following aeration, the treated effluent is settled in a clarifier prior to discharge to the Charleville stream.

It is estimated that the daily loading of leechate is circa 15-40PE depending on the time of year.

Sludge from the aeration process and the clarifier is drawn off periodically, thickened and dried in-situ and disposed off-site.

1.2 The plant is located approx. 37km to the South of Lower River Shannon SPA. The Lower River Shannon Special Protection Area is designated under the **EU Birds Directive (79/409/EEC)** as transposed into Irish Law under the European Union (Natural Habitats) Regulations SI 94/1997. As this is the case, and in accordance with requirements under this Directive, the potential impacts of proposed developments that have the potential to impact on Special Protection Areas must be assessed. The procedure to do this is called a **Habitats Directive Assessment**. The purpose of such an assessment is to identify whether there may be potential for elements of the project to have a significant impact on nature conservation sites within its impact zone, and if so, to predict the potential for such impacts to affect the overall integrity of such nature conservation sites. The European Union has provided guidance as to how to make a Habitats Directive Assessment which identifies four main stages in the process as follows:

### Stage One: Screening

*The process which identifies the likely impacts upon a Natura 2000 site of a project or plan, wither alone or in combination with other projects or plans, and considers whether these impacts are likely to be significant.*

### Stage Two: Appropriate assessment

*The consideration of the impact on the integrity of the Natura 2000 site of the project or plan, either alone or in combination with other projects or plans, with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, an assessment of the potential mitigation of those impacts.*

### Stage Three: Assessment of alternative solutions

*The process which examines alternative ways of achieving the objectives of the project or plan that avoid adverse impacts on the integrity of the Natura 2000 site.*

Stage Four: Assessment where no alternative solutions exist and where adverse impacts remain.

*An assessment of compensatory measures, where in the light of an assessment of imperative reasons of overriding public interest, it is deemed that the project or plan should proceed.*

- 1.3 This document brings together all of the information necessary to make determination as to whether there are likely to be significant impacts arising from the Charleville Waste Water Treatment Plant and represents the first stage of this process (Screening).

*Step 1:*

*Provide a description of the plan and other plans and projects that, in combination, have the potential to have significant effects on Natura 2000 sites within the potential impact zone;*

*Step 2:*

*Identify Natura 2000 sites which may be impacted by the plan, and compile information on their qualifying interests and conservation objectives;*

*Step 3:*

*Determine whether the plan needs to be screened for potential impacts on Natura 2000 sites;*

*Step 4 :*

*Carry out an assessment of likely effects – direct, indirect and cumulative – undertaken on the basis of available information as a desk study or field survey or primary research as necessary;*

*Step 5:*

*Assess the significance of any such effects on the Natura 2000 sites within the impact zone.*

- 1.4 The assessment has been prepared in accordance with the following guidance:

European Commission (2000) Managing Natura 2000 sites: the provisions of Article 6 of the Habitats Directive 92/43/EEC.

European Commission (2001) Assessment of plans and projects significantly affecting Natura 2000 sites: Methodological guidance on the provisions of Articles 6(3) and (4) of the Habitats Directive 92/43/EEC.

Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities. Environment, Heritage and Local Government, 2009.



## 2 Appropriate Assessment Screening Matrix

2.1 Description of project	
Location	Charleville WWTP, Charleville, Cork.
Description of the key components of the project	<p>Mechanical Screening (with manual bypass) – Screenings disposed off-site.            Secondary treatment via an oxidation ditch.            Clarification of treated effluent with return of activated sludge            Picket fence thickener of waste activated sludge            Belt press for thickening of waste sludge. Sludge disposed off-site.</p> <p>Discharge of treated effluent via SW01-CHVE to the Charleville Stream. On average approx. 4500m<sup>3</sup>/day is discharged to the stream. A significant portion of this is due to infiltration in the collection system.</p> <p>Other discharges to the Charleville stream include 3 no storm water overflows;            SW02-CHVE: 600mm dia outfall from inlet flume in WWTP. Flows in excess of 6DWF bypass treatment and flow directly into the stream. No flow data available.            SW03-CHVE: 600mm dia. Outfall from overflow manhole, flows directly into Charleville Stream. No flow data available.            SW04-CHVE: 250mm dia. Outfall from overflow manhole, flows directly into Charleville Stream. No flow data available.</p>
Distance from designated sites in potential impact zone*	<p>River Shannon SAC &gt; 35 km down stream. The primary discharge is not located within an area designated for nature conservation.</p> <p>Source webviewer @ www.npws.ie</p>

2.2 Description of the Natura 2000 sites within the potential impact zone <sup>1</sup>	
Name	Lower River Shannon
Site Code	002165
Site Description	<p>The lower River Shannon SAC is of major conservation importance and includes 14 habitats listed on Annex 1 of the EU Habitats Directive including lagoons, alluvial wet woodland, floating river vegetation, <i>Molinia</i> meadows, estuaries, tidal sand band, perennial vegetation of stoney banks, sea cliffs, reefs and large shallow inlets and bays. The following Annex II species can be found with the Lower River Shannon SAC: Otter (<i>Lutra lutra</i>), Sea Lamprey (<i>Petromyzon marinus</i>), River Salom (<i>Salmo salar</i>),</p>

<sup>1</sup> Natura 2000 sites within the potential impact zone of the proposed development have been identified in accordance with guidance provided in the NPWS circular L8/08.



	<p>Fresh water pearl mussel (<i>margaritifera margaritifera</i>) and bottle-nosed Dolphin (<i>Tursiops truncatus</i>).</p> <p>Overall, the Shannon and Fergus estuaries support the largest numbers of wintering waterfowl in Ireland. The highest count in 1995-96 was 51,423 while in 1994-95 it was 62,701. Species listed on Annex 1 of the E.U. Birds Directive which contributed to these totals include; Great Northern Diver, Whooper Swan, Pale-bellied Brent Goose, Golden Plover and bar-tailed Godwit. This is the most important coastal site in Ireland for a number of waders including Lapwing, Dunlin, Snipe and Redshank. It also provides an important staging ground for species such as Blacktailed Godwit and Greenshank. A number of species listed on Annex 1 of the EU birds Directive breed within the site including peregrine Falcon, Sandwich tern, Common Tern, Chough and Kingfisher.</p> <p>The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The River Shannon and River Fergus Estuaries SPA site comprises all of the estuarine habitat west from Limerick city and south from Ennis, extending west as far as Killadysert and Foynes on the north and south shores respectively of the River Shannon. The site is the most important coastal wetland site in the country and regularly supports in excess of 50,000 wintering waterfowl with species such as Dunlin, Black-tailed Godwit and Redshank. In addition, there are 16 species that have populations of national importance. For several bird species, it is the most important site in the country. Three of the species, which occur regularly on the site, are listed in Annex 1 of the EU Birds Directive: Whooper Swan, Golden Plover and bar-tailed Godwit.</p> <p>Much of the land adjacent to the rivers and estuaries have been reclaimed for agriculture and continues to pose a threat to these habitats. The site receives pollution from several sources, including industry and agriculture, but it is not known if this has any significant impact on the wintering birds. Future increases in aquaculture activity could cause disturbance to habitats and the associated birds. Future increases in aquaculture activity could cause disturbance to habitats and the associated birds. Common Cordgrass is well-established and may threaten some of the estuarine habitats. Some disturbance occurs from boating activities.</p> <p>The Full Site synopsis for this Natura 2000 site is included in the Appendix 1 of this report.</p>
<p>Qualifying Interests of Lower Shannon SPA.</p>	<ul style="list-style-type: none"> <li>○ Annex I listed species: Whooper Swan, Golden Plover and Bar-tailed Godwit</li> <li>○ Regularly occurring migratory species: Dunlin, Black-tailed Godwit, Redshank (Present in internationally important numbers), Cormorant, Scaup, Golden Plover, Grey plover, Lapwing, Knot, Bar-tailed Godwit, Curlew, Greenshank (nationally important species).</li> <li>○ Wetlands such as intertidal mudflats, salt marshes, tidal creeks in the inner estuaries are all attractive to migratory birds.</li> </ul>



Conservation Objectives	<p>Draft Conservation Objectives were drawn up in 2000 by the NPWS, but were never circulated for Public consultation. Four objectives were listed;</p> <ul style="list-style-type: none"> <li>○ To maintain the Annex I habitats for which the cSAC was selected at favourable conservation status.</li> <li>○ To maintain the Annex II species for which the cSAC was selected at favourable conservation status.</li> <li>○ To maintain the distribution and extent of habitats supporting the species;</li> <li>○ To establish effective liaison and co-operation with landowners, legal users and relevant authorities.</li> </ul> <p><i>Source – National Parks and Wildlife Service</i></p>
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<b>2.3 Assessment Criteria</b>	
Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the Natura 2000 site.	<p><b>Discharge from Charleville WWTP:</b> Treated effluent from the Charleville Waste Water Treatment Plant is discharged to Charleville Stream circa 3.5 km upstream of the confluence with the River Maigue, circa 35 Km upstream from the confluence with the River Shannon. The discharge consists primarily of treated effluent from the Charleville Waste Water Treatment Plant but can also include untreated discharges from storm water overflow during heavy rain.</p>
Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the Natura 2000 site taking into account the following: <ul style="list-style-type: none"> <li>○ Size and scale</li> <li>○ Land-take</li> <li>○ Distance from the Natura 2000 site or key features of the site:</li> <li>○ Resource requirements (water abstraction etc.)</li> <li>○ Emissions</li> </ul>	<p>Discharges could give rise to elevated nutrients in the Lower Shannon SPA. Increased nutrient levels may impact on the ecology of an area by changing the composition of floral communities and reducing the ability of less robust plants to survive. Increased nutrient levels may also result in increasing the invertebrate populations in the estuary, thereby increasing bird population levels.</p> <p>However the potential for the treatment plant to result in elevated nutrients within the SPA is reduced by a number of factors:</p> <ol style="list-style-type: none"> <li>1. The standard of treated effluent is high.</li> <li>2. The discharge point is circa 35 kms upstream of the SPA.</li> </ol> <p><b>1 The standard of treated effluent is high.</b> Treated effluent from the Charleville WWTP is monitored by the operator on a daily basis and by CCC six times per year. Water quality monitoring was carried out by CCC in 2007/2008 upstream and downstream of the discharge point. Effluent testing demonstrates that treated effluent consistently meets standards set out in the Urban Wastewater Treatment Regulations (see appendix 2 for effluent testing results). The results of monitoring indicate that there has been no deterioration in water quality.</p> <p><b>Note 1:</b> See appendix 2 for effluent quality results for 2007</p>

<p>(disposal to land, water or air)</p> <ul style="list-style-type: none"> <li>○ Excavation Requirements</li> <li>○ Transportation Requirements</li> <li>○ Duration of construction, operation, decommissioning</li> <li>○ Other.</li> </ul>	<p>and 2008.</p> <p><b>Note 2:</b> The samples taken do not take account of the overflow volumes being intermittently discharged as the composite sampler is located upstream of where the overflow volume meets the treated effluent volume.</p> <p><b>Note 3:</b> As overflows occur in times of heavy rain the assumption must be made that what is discharged is substantially diluted.</p> <p><b>1 The discharge point is circa 35km upstream of the SPA.</b> The effluent is discharged into the Charleville stream which in turn discharges into the River Maigue prior to discharge to the Lower Shannon SPA.</p>
<p>Describe any likely changes to the site arising as a result of:</p> <ul style="list-style-type: none"> <li>○ Reduction in habitat area</li> <li>○ Disturbance to key species</li> <li>○ Habitat or species fragmentation</li> <li>○ Reduction in species density</li> <li>○ Changes in key indicators of conservation value (water quality etc)</li> <li>○ Climate Change</li> </ul>	<p><b>Reduction in habitat area:</b> Treated effluent complies with standards laid down in the Urban Waste Water Treatment Regulations. No significant impacts are evident or predicted on habitats along the River Maigue arising from the operation of this facility.</p> <p><b>Disturbance to key species:</b> The operation of the WWTP does not cause any disturbance to species within the SPA.</p> <p><b>Habitat or species fragmentation:</b> No habitat fragmentation has been caused as a result of the operation of this facility.</p> <p><b>Reduction in species density:</b> Treated effluent complies with standards laid down in the Urban Waste Water Treatment Regulations and is discharging to a large well-exchanged body of water where dilution and dispersion potential is high. No significant impacts are evident or predicted on species for which the SPA is designated.</p> <p><b>Changes in key indicators of conservation value eg water quality:</b> While there is no ongoing monitoring of water quality for either the Charleville stream, there is numerous water quality monitoring stations on the River Maigue. Immediately downstream of the confluence of the Charleville stream and the Maigue River the water quality status is considered 'Good' (Q4). This status is maintained throughout the body of the Maigue River.</p> <p><i>Source EPA online map viewer. <a href="http://www.epa.ie">www.epa.ie</a></i></p>
<p>Describe any likely impacts on the Natura</p>	<p><b>Interference with the key relationships that define the structure of the site:</b></p>



<p>2000 site as a whole in terms of:</p> <ul style="list-style-type: none"> <li>○ Interference with the key relationships that define the structure of the site</li> <li>○ Interference with key relationships that define the function of the site</li> </ul>	<p><i>The structure of the SPA is not impacted by the operation of this facility.</i></p> <p><b>Interference with key relationships that define the function of the site:</b>  <i>The function of the SPA is not impacted by the operation of this facility.</i></p>
<p>Describe from the above those elements of the project of plan, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.</p>	<p>No significant impacts are predicted.</p>

### 3. Finding of No Significant Effects Report Matrix

<p>Name of project or plan</p>	<p>Charleville WWTP discharge</p>
<p>Name and location of Natura 2000 site</p>	<p>River Shannon SPA.</p>
<p>Description of the project or plan</p>	<p>Charleville WWTP consists of an oxidation treatment system which treats the waste generated to the standards set down by the Urban Wastewater Treatment Regulations.  There are 3 nr. unscreened storm water overflows in the collection system which also overflow to the Charleville stream.</p>
<p>Is the project or plan directly connected with or necessary to the management of the site (provide details)?</p>	<p>No</p>

### The assessment of significance of effects

<p>Describe how the project or plan (alone or in combination) is likely to affect the Natura 2000 Site.</p>	<p>Discharges from the Charleville WWTP either alone or in combination with discharges from other sources could give rise to elevated nutrients entering Lower River Shannon. Increased nutrient levels may impact on the ecology of an area by changing the composition of floral communities and reducing the ability of less robust plants to survive. Increased nutrient levels may also result in increasing the invertebrate populations in the estuary, thereby increasing bird population levels.</p>
<p>Explain why these effects are not considered significant.</p>	<p>Treated effluent complies with standards laid down in the Urban Waste Water Treatment Regulations and is discharging to a large body of water (River Maigue) where dilution potential is high. The Discharge is located 35km upstream of the SPA.</p> <p>No significant impacts are evident or predicted on species for which the SPA is designated.</p> <p>The WWTP has significant spare capacity to cater for increases in the waste stream.</p> <p>Therefore it is considered that a Stage 2 – Appropriate Assessment is not necessary.</p>

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## Appendix 1

### SITE SYNOPSIS: LOWER RIVER SHANNON

#### SITE CODE : 002165

This very large site stretches along the Shannon valley from Killaloe to Loop Head/ Kerry Head, a distance of some 120 km. The site thus encompasses the Shannon, Feale, Mulkear and Fergus Estuaries, the freshwater lower reaches of the River Shannon (between Killaloe and Limerick), the freshwater stretches of much of the Feale and Mulkear catchments and the marine area between Loop Head and Kerry Head. The Shannon and Fergus flow through Carboniferous limestone as far as Foynes, but west of Foynes Namurian shales and flagstones predominate (except at Kerry Head, which is formed from Old Red Sandstone). The eastern sections of the Feale catchment flow through Namurian Rocks and the western stretches through Carboniferous Limestone. The Mulkear flows through Lower Palaeozoic Rocks in the upper reaches before passing through Namurian Rocks, followed by Lower Carboniferous Shales and Carboniferous Limestone. The Mulkear River itself, immediately north of Pallas Green, passes through an area of Rhyolites, Tuffs and Agglomerates. Rivers within the sub-catchment of the Feale include the Galey, Smearlagh, Oolagh, Allaughaun, Owveg, Clydagh, Caher, Breanagh and Glenacarney. Rivers within the sub-catchment of the Mulkear include the Killeenagarraff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia.

The site is a candidate SAC selected for lagoons and alluvial wet woodlands, both habitats listed on Annex I of the E.U. Habitats Directive. The site is also selected for floating river vegetation, *Molinia* meadows, estuaries, tidal mudflats, Atlantic salt meadows, Mediterranean salt meadows, *Salicornia* mudflats, sand banks, perennial vegetation of stony banks, sea cliffs, reefs and large shallow inlets and bays 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 – Bottle-nosed Dolphin, Sea Lamprey, River Lamprey, Brook Lamprey, Freshwater Pearl Mussel, Atlantic Salmon and Otter.

The Shannon and Fergus Estuaries form the largest estuarine complex in Ireland. They form a unit stretching from the upper tidal limits of the Shannon and Fergus Rivers to the mouth of the Shannon estuary (considered to be a line across the narrow strait between Kilcredaun Point and Kilconly Point). Within this main unit there are several tributaries with their own 'sub-estuaries' e.g. the Deel River, Mulkear River, and Maigue River. To the west of Foynes, a number of small estuaries form indentations in the predominantly hard coastline, namely Poulnasherry Bay, Ballylongford Bay, Clonderalaw Bay and the Feale or Cashen River Estuary.

Both the Fergus and inner Shannon estuaries feature vast expanses of intertidal mudflats, often fringed with saltmarsh vegetation. The smaller estuaries also feature mudflats, but have their own unique characteristics, e.g. Poulnasherry Bay is stony and unusually rich in species and biotopes. Plant species are typically scarce on the mudflats, although there are some Eel-grass beds (*Zostera* spp.) and patches of green algae (e.g. *Ulva* sp. and *Enteromorpha* sp.). The main macro-invertebrate community, which has been noted from the inner Shannon and Fergus estuaries, is a *Macoma-Scrobicularia-Nereis* community.

In the transition zone between mudflats and saltmarsh, specialised colonisers of mud predominate: swards of Common Cord-grass (*Spartina anglica*) frequently occur in the upper parts of the estuaries. Less common are swards of Glasswort (*Salicornia europaea* agg.). In the innermost parts of the estuaries, the tidal channels or creeks are fringed with species such as Common Reed (*Phragmites australis*) and Club-rushes (*Scirpus maritimus*, *S. tabernaemontani* and *S. triqueter*). In addition to the nationally rare Triangular Club-rush



(*Scirpus triqueter*), two scarce species are found in some of these creeks (e.g. Ballinacurra Creek): Lesser Bulrush (*Typha angustifolia*) and Summer Snowflake (*Leucojum aestivum*).

Saltmarsh vegetation frequently fringes the mudflats. Over twenty areas of estuarine saltmarsh have been identified within the site, the most important of which are around the Fergus Estuary and at Ringmoylan Quay. The dominant type of saltmarsh present is Atlantic salt meadow occurring over mud. Characteristic species occurring include Common Saltmarsh Grass (*Puccinellia maritima*), Sea Aster (*Aster tripolium*), Thrift (*Armeria maritima*), Sea-milkwort (*Glaux maritima*), Sea Plantain (*Plantago maritima*), Red Fescue (*Festuca rubra*), Creeping Bent (*Agrostis stolonifera*), Saltmarsh Rush (*Juncus gerardi*), Long-bracted Sedge (*Carex extensa*), Lesser Sea-spurrey (*Spergularia marina*) and Sea Arrowgrass (*Triglochin maritima*). Areas of Mediterranean salt meadows, characterised by clumps of Sea Rush (*Juncus maritimus*) occur occasionally. Two scarce species are found on saltmarshes in the vicinity of the Fergus Estuary: a type of robust Saltmarsh-grass (*Puccinellia foucaudii*), sometimes placed within the compass of Common Saltmarsh-grass (*Puccinellia maritima*) and Hard-grass (*Parapholis strigosa*).

Saltmarsh vegetation also occurs around a number of lagoons within the site. The two which have been surveyed as part of a National Inventory of Lagoons are Shannon Airport Lagoon and Cloonconeen Pool. Cloonconeen Pool (4-5 ha) is a natural sedimentary lagoon impounded by a low cobble barrier. Seawater enters by percolation through the barrier and by overwash. This lagoon represents a type which may be unique to Ireland since the substrate is composed almost entirely of peat. The adjacent shore features one of the best examples of a drowned forest in Ireland. Aquatic vegetation in the lagoon includes typical species such as Beaked Tasselweed (*Ruppia maritima*) and green algae (*Cladophora* sp.). The fauna is not diverse, but is typical of a high salinity lagoon and includes six lagoon specialists (*Hydrobia ventrosa*, *Cerastoderma glaucum*, *Lekanesphaera hookeri*, *Palaemonetes varians*, *Sigara stagnalis* and *Enochrus bicolor*). In contrast, Shannon Airport Lagoon (2 ha) is an artificial saline lake with an artificial barrier and sluices outlet. However, it supports two Red Data Book species of Stonewort (*Chara canescens* and *Chara cf. connivens*).

Most of the site west of Kilcredaun Point/Kilconly Point is bounded by high rocky sea cliffs. The cliffs in the outer part of the site are sparsely vegetated with lichens, Red Fescue, Sea Beet (*Beta vulgaris*), Sea Campion (*Silene maritima*), Thrift and Plantains (*Plantago* spp.). A rare endemic Sea Lavender (*Limonium recurvum* subsp. *pseudotranswallinum*) occurs on cliffs near Loop Head. Cliff-top vegetation usually consists of either grassland or maritime heath. The boulder clay cliffs further up the estuary tend to be more densely vegetated, with swards of Red Fescue and species such as Kidney Vetch (*Anthyllis vulneraria*) and Bird's-foot Trefoil (*Lotus corniculatus*).

The site supports an excellent example of a large shallow inlet and bay. Littoral sediment communities in the mouth of the Shannon Estuary occur in areas that are exposed to wave action and also in areas extremely sheltered from wave action. Characteristically, exposed sediment communities are composed of coarse sand and have a sparse fauna. Species richness increases as conditions become more sheltered. All shores in the site have a zone of sand hoppers at the top and below this each of the shores has different characteristic species giving a range of different shore types in the pSAC.

The intertidal reefs in the Shannon Estuary are exposed or moderately exposed to wave action and subject to moderate tidal streams. Known sites are steeply sloping and show a good zonation down the shore. Well developed lichen zones and littoral reef communities offering a high species richness in the sublittoral fringe and strong populations of *Paracentrotus lividus* are found. The communities found are tolerant to sand scour and tidal streams. The infralittoral reefs range from sloping platforms with some vertical steps to ridged bedrock



with gullies of sand between the ridges to ridged bedrock with boulders or a mixture of cobbles, gravel and sand. Kelp is very common to about 18m. Below this it becomes rare and the community is characterised by coralline crusts and red foliose algae.

Other coastal habitats that occur within the site include the following:

- stony beaches and bedrock shores - these shores support a typical zonation of seaweeds (*Fucus* spp., *Ascophyllum nodosum* and kelps).
- shingle beaches - the more stable areas of shingle support characteristic species such as Sea Beet, Sea Mayweed (*Matricaria maritima*), Sea Campion and Curled Dock (*Rumex crispus*).
- Sandbanks which are slightly covered by sea water at all times – there is a known occurrence of sand/gravel beds in the area from Kerry Head to Beal Head.
- sand dunes - a small area of sand dunes occurs at Beal Point. The dominant species is Marram Grass (*Ammophila arenaria*).

Flowing into the estuaries are a number of tidal rivers. In some cases non-tidal portions of the rivers have been included in the site, most notably the Shannon from Killaloe to Limerick (along with some of its tributaries, such as the Mulkear and Feale catchments and the Kilmastulla River), the Fergus up as far as Ennis, and the Cloon River. The three rivers are very different in character: the Shannon being broad, generally slow-flowing and naturally eutrophic; the Fergus being smaller and alkaline; while the narrow, fast-flowing Cloon is acid in nature. Semi-natural habitats, such as wet grassland, wet woodland and marsh occur by the rivers, however, improved grassland is most common. One grassland type of particular conservation significance, *Molinia* meadows, occurs in several parts of the site and the examples at Worldsend on the River Shannon are especially noteworthy. Here are found areas of wet meadow dominated by rushes and sedges and supporting a diverse and species-rich vegetation, including such uncommon species as Blue-eyed Grass (*Sisyrinchium bermudiana*) and Pale Sedge (*Carex pallescens*).

Floating river vegetation characterised by species of Water-crowfoot (*Ranunculus* spp.), Pondweeds (*Potamogeton* spp.) and the moss *Fontinalis antipyretica* are present throughout the major river systems within the site. The rivers contain an interesting bryoflora with *Schistidium alpicola* var. *alpicola* recorded from in-stream boulders on the Bilboa, new to county Limerick.

Alluvial woodland occurs on the banks of the Shannon and on islands in the vicinity of the University of Limerick. The woodland is up to 50m wide on the banks and somewhat wider on the largest island. The most prominent woodland type is gallery woodland where White Willow (*Salix alba*) dominates the tree layer with occasional Alder (*Alnus glutinosa*). The shrub layer consists of various willow species with sally (*Salix cinerea* ssp. *oleifolia*) and what appear to be hybrids of *S. alba* x *S. viminalis*. The herbaceous layer consists of tall perennial herbs. A fringe of Bulrush (*Typha* sp.) occurs on the riverside of the woodland. On slightly higher ground above the wet woodland and on the raised embankment remnants of mixed oak-ash-alder woodland occur. These are poorly developed and contain numerous exotic species but locally there are signs that it is invading open grassland. Alder is the principal tree species with occasional Oak (*Quercus robur*), Elm (*Ulmus glabra*, *U. procera*), Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*) and the shrubs Guelder-rose (*Viburnum opulus*) and willows. The ground flora is species-rich.

Woodland is infrequent within the site, however Cahiracon Wood contains a strip of old Oak woodland. Sessile Oak (*Quercus petraea*) forms the canopy, with an understorey of Hazel and Holly (*Ilex aquifolium*). Great Wood-rush (*Luzula sylvatica*) dominates the ground flora.



Less common species present include Great Horsetail (*Equisetum telmateia*) and Pendulous Sedge (*Carex pendula*).

In the low hills to the south of the Slievefelim mountains, the Cahernahallia River cuts a valley through the Upper Silurian rocks. For approximately 2km south of Cappagh Bridge at Knockanavar, the valley sides are wooded. The woodland consists of Birch (*Betula* spp.), Hazel, Oak, Rowan (*Sorbus aucuparia*), some Ash (*Fraxinus excelsior*) and Willow (*Salix* spp.). Most of the valley is not grazed by stock, and as a result the trees are regenerating well. The ground flora feature prominent Greater wood-rush and Bilberry (*Vaccinium myrtillus*) with a typical range of woodland herbs. Where there is more light available, Bracken (*Pteridium aquilinum*) features.

The valley sides of the Bilboa and Gortnageragh Rivers, on higher ground north east of Cappamore, support patches of semi-natural broadleaf woodland dominated by Ash, Hazel, Oak and Birch. There is a good scrub layer with Hawthorn, Willow, Holly and Blackthorn (*Prunus spinosa*) common. The herb layer in these woodlands is often open with a typically rich mixture of woodland herbs and ferns. Moss species diversity is high. The woodlands are ungrazed. The hazel is actively coppiced in places.

There is a small area of actively regenerating cut away raised bog at Ballyrorheen. It is situated approx. 5km north west of Cappamore Co. Limerick. The bog contains some wet areas with good moss (*Sphagnum*) cover. Species of particular interest include the Cranberry (*Vaccinium oxycoccos*) and the White Sedge (*Carex curta*) along with two other regionally rare mosses including *S. fimbriatum*. The site is being invaded by Birch (*Betula pubescens*) scrub woodland. Both commercial forestry and the spread of rhododendron has greatly reduced the overall value of the site.

A number of plant species that are Irish Red Data Book species occur within the site - several are protected under the Flora (Protection) Order, 1999:

- Triangular Club-rush (*Scirpus triquetus*) - in Ireland this protected species is only found in the Shannon Estuary, where it borders creeks in the inner estuary.
- Opposite-leaved Pondweed (*Groenlandia densa*) - this protected pondweed is found in the Shannon where it passes through Limerick City.
- Meadow Barley (*Hordeum secalinum*) - this protected species is abundant in saltmarshes at Ringmoylan and Mantlehill.
- Hairy Violet (*Viola hirta*) - this protected violet occurs in the Askeaton/Foynes area.
- Golden Dock (*Rumex maritimus*) - noted as occurring in the River Fergus Estuary.
- Bearded Stonewort (*Chara canescens*) - a brackish water specialist found in Shannon Airport lagoon.
- Convergent Stonewort (*Chara connivens*) - presence in Shannon Airport Lagoon to be confirmed.

Overall, the Shannon and Fergus Estuaries support the largest numbers of wintering waterfowl in Ireland. The highest count in 1995-96 was 51,423 while in 1994-95 it was 62,701. Species listed on Annex I of the E.U. Birds Directive which contributed to these totals include: Great Northern Diver (3; 1994/95), Whooper Swan (201; 1995/96), Pale-bellied Brent Goose (246; 1995/96), Golden Plover (11,067; 1994/95) and Bar-tailed Godwit (476; 1995/96). In the past, three separate flocks of Greenland White-fronted Goose were regularly found but none were seen in 1993/94.

Other wintering waders and wildfowl present include Greylag Goose (216; 1995/96), Shelduck (1,060; 1995/96), Wigeon (5,976; 1995/96); Teal (2,319; 1995-96); Mallard (528;



1995/96), Pintail (45; 1995/96), Shoveler (84; 1995/96), Tufted Duck (272; 1995/96), Scaup (121; 1995/96), Ringed Plover (240; 1995/96), Grey Plover (750; 1995/96), Lapwing (24,581; 1995/96), Knot (800; 1995/96), Dunlin (20,100; 1995/96), Snipe (719, 1995/96), Black-tailed Godwit (1062; 1995/96), Curlew (1504; 1995/96), Redshank (3228; 1995/96), Greenshank (36; 1995/96) and Turnstone (107; 1995/96). A number of wintering gulls are also present, including Black-headed Gull (2,216; 1995/96), Common Gull (366; 1995/96) and Lesser Black-backed Gull (100; 1994/95). This is the most important coastal site in Ireland for a number of the waders including Lapwing, Dunlin, Snipe and Redshank. It also provides an important staging ground for species such as Black-tailed Godwit and Greenshank.

A number of species listed on Annex I of the E.U. Birds Directive breed within the site. These include Peregrine Falcon (2-3 pairs), Sandwich Tern (34 pairs on Rat Island, 1995), Common Tern (15 pairs: 2 on Sturamus Island and 13 on Rat Island, 1995), Chough (14-41 pairs, 1992) and Kingfisher. Other breeding birds of note include Kittiwake (690 pairs at Loop Head, 1987) and Guillemot (4010 individuals at Loop Head, 1987)

There is a resident population of Bottle-nosed Dolphin in the Shannon Estuary consisting of at least 56-68 animals (1996). This is the only known resident population of this E.U. Habitats Directive Annex II species in Ireland. Otter, a species also listed on Annex II of this directive, is commonly found on the site.

Five species of fish listed on Annex II of the E.U. Habitats Directive are found within the site. These are Sea Lamprey (*Petromyzon marinus*), Brook Lamprey (*Lampetra planeri*), River Lamprey (*Lampetra fluviatilis*), Twaite Shad (*Allosa fallax fallax*) and Salmon (*Salmo salar*). The three lampreys and Salmon have all been observed spawning in the lower Shannon or its tributaries. The Fergus is important in its lower reaches for spring salmon while the Mulkear catchment excels as a grilse fishery though spring fish are caught on the actual Mulkear River. The Feale is important for both types. Twaite Shad is not thought to spawn within the site. There are few other river systems in Ireland which contain all three species of Lamprey.

Two additional fish of note, listed in the Irish Red Data Book, also occur, namely Smelt (*Osmerus eperlanus*) and Pollan (*Coregonus autumnalis pollan*). Only the former has been observed spawning in the Shannon.

Freshwater Pearl-mussel (*Margaritifera margaritifera*), a species listed on Annex II of the E.U. Habitats Directive, occurs abundantly in parts of the Cloon River.

There is a wide range of landuses within the site. The most common use of the terrestrial parts is grazing by cattle and some areas have been damaged through over-grazing and poaching. Much of the land adjacent to the rivers and estuaries has been improved or reclaimed and is protected by embankments (especially along the Fergus Estuary). Further, reclamation continues to pose a threat as do flood relief works (e.g. dredging of rivers). Gravel extraction poses a major threat on the Feale.

In the past, Cord-grass (*Spartina* sp.) was planted to assist in land reclamation. This has spread widely, and may oust less vigorous colonisers of mud and may also reduce the area of mudflat available to feeding birds.

Domestic and industrial wastes are discharged into the Shannon, but water quality is generally satisfactory - except in the upper estuary, reflecting the sewage load from Limerick City. Analyses for trace metals suggest a relatively clean estuary with no influences by industrial discharges apparent. Further industrial development along the Shannon and water polluting operations are potential threats.



Fishing is a main tourist attraction on the Finn and there are a large number of Angler Associations, some with a number of beats. Fishing stands and styles have been erected in places. The River Feale is a designated Salmonid Water under the E.U. Freshwater Fish Directive. Other uses of the site include commercial angling, oyster farming, boating (including dolphin-watching trips) and shooting. Some of these may pose threats to the birds and dolphins through disturbance. Specific threats to the dolphins include underwater acoustic disturbance, entanglement in fishing gear and collisions with fast moving craft.

This site is of great ecological interest as it contains a high number of habitats and species listed on Annexes I and II of the E.U. Habitats Directive, including the priority habitat lagoon, the only known resident population of Bottle-nosed Dolphin in Ireland and all three Irish lamprey species. A good number of Red Data Book species are also present, perhaps most notably the thriving populations of Triangular Club-rush. A number of species listed on Annex I of the E.U. Birds Directive are also present, either wintering or breeding. Indeed, the Shannon and Fergus Estuaries form the largest estuarine complex in Ireland and support more wintering wildfowl and waders than any other site in the country. Most of the estuarine part of the site has been designated a Special Protection Area (SPA), under the E.U. Birds Directive, primarily to protect the large numbers of migratory birds present in winter.

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## **Appendix 2:**



**Treated Effluent Quality Data 2007 and 2008 quality data.**

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## Charleville Downstream-Table E

Sample Date	21/02/2007	08/03/2007	03/05/2007	13/09/2007	16/01/2008*	14/02/2008	17/07/2008
Sample	river	river	river	river	River	River	River
Flow M <sup>3</sup> /Day	*	*	*	*	*	*	*
pH	7.8	7.9	*	8	7.8	8.3	8
Temperature °C	*	*	*	*	*	*	*
Cond 20°C	*	*	*	*	696	*	1204
SS mg/L	*	6	*	*	3	9	5
NH <sub>3</sub> mg/L	*	0.1	1.2	4.1	0.4	<0.1	<0.1
BOD mg/L	7.7	2.4	2.5	7.33	4	5.05	2.45
COD mg/L	*	<21	*	*	<10	*	<21
TN mg/L	17.5	5.8	8.6	10.5	*	*	8
Nitrite mg/L	*	*	*	*	*	*	*
Nitrate mg/L	*	*	*	*	*	*	*
TP mg/L	0.43	0.3	1.24	1.94	0.33	0.66	<0.2
O-PO4-P mg/L	*	*	*	*	0.26	0.6	0.9
SO4 mg/L	*	*	*	<30	*	<30	<30
Phenols µg/L	*	*	*	*	*	*	<0.1
Atrazine µg/L	*	*	*	*	*	*	<0.01
Dichloromethane µg/L	*	*	*	*	*	*	<1.0
Simazine µg/L	*	*	*	*	*	*	<0.01
Toluene µg/L	*	*	*	*	*	*	<1.0
Tributyltin µg/L	*	*	*	*	*	*	*
Xylenes µg/L	*	*	*	*	*	*	<1.0
Arsenic µg/L	*	*	*	*	*	*	1
Chromium mg/L	*	*	*	*	*	<0.02	<0.02
Copper mg/L	*	*	*	*	*	<0.02	<0.02
Cyanide µg/L	*	*	*	*	*	*	<5
Fluoride	*	*	*	*	*	*	*
Lead mg/L	*	*	*	*	*	0.056	0.037
Nickel mg/L	*	*	*	*	*	<0.02	<0.02
Zinc mg/L	*	*	*	*	*	<0.02	<0.02
Boron mg/L	*	*	*	*	*	<0.02	<0.02
Cadmium mg/L	*	*	*	*	*	<0.02	<0.02
Mercury µg/L	*	*	*	*	*	*	0.2
Selenium µg/L	*	*	*	*	*	*	2
Barium mg/L	*	*	*	*	*	0.08	0.027

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## Charleville Upstream-Table E

Sample Date	21/02/2007	08/03/2007	03/05/2007	13/09/2007	14/02/2008	10/04/2008	17/07/2008
Sample	river	river	river	river	River	River	River
Flow M <sup>3</sup> /Day	*	*	*	*	*	*	*
pH	8	8	*	8.4	8.5	*	8.3
Temperature °C	*	*	*	*	*	*	*
Cond 20°C	*	*	*	*	*	*	2.88
SS mg/L	<2.5	<2.5	3	6	3	*	11
NH <sub>3</sub> mg/L	<0.1	0.1	<0.1	<0.1	0.1		<0.1
BOD mg/L	<1	<1	<1	1.68	1.31		1.22
COD mg/L	*	<21	*	*	*	*	<21
TN mg/L	17.7	*	7.65	8.9	*	*	3.8
Nitrite mg/L	*	*	*	*	*	*	*
Nitrate mg/L	*	*	*	*	*	*	*
TP mg/L	<0.2	<0.2	0.21	1	<0.2		0.38
O-PO <sub>4</sub> -P mg/L	*	*	*	0.33	0.09	0.08	0.15
SO <sub>4</sub> mg/L	*	*	*	<30	<30	*	<30
Phenols µg/L	*	*	*	*	*	*	<0.1
Atrazine µg/L	*	*	*	*	*	*	<0.01
Dichloromethane µg/L	*	*	*		*	*	<1.0
Simazine µg/L	*	*	*	*	*	*	<0.01
Toluene µg/L	*	*	*	*	*	*	<1.0
Tributyltin µg/L	*	*		*	*	*	*
Xylenes µg/L	*	*		*	*	*	<1.0
Arsenic µg/L	*	*	*	*	*	*	2
Chromium mg/L	*	*	*	*	<0.02	*	<0.02
Copper mg/L	*	*	*	*	<0.02	*	<0.02
Cyanide µg/L	*	*	*	*	*	*	<5
Fluoride	*	*	*	*	*	*	*
Lead mg/L	*	*	*	*	0.051	*	0.026
Nickel mg/L	*	*	*	*	<0.02	*	<0.02
Zinc mg/L	*	*	*	*	<0.02	*	0.034
Boron mg/L	*	*	*	*	<0.02	*	<0.02
Cadmium mg/L	*	*	*	*	<0.02	*	<0.02
Mercury µg/L	*	*	*	*	*	*	<0.2
Selenium µg/L	*	*	*	*	*	*	5
Barium mg/L	*	*	*	*	0.045	*	0.066

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