Natura Impact Statement for proposed Integrated Constructed Wetland (ICW) at Goresbridge, Co. Kilkenny

DAU Reference No.: G Pre00428/2012

prepared by OPENFIELD Ecological Services
for Connollys Redmills

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www.openfield.ie

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1.0 INTRODUCTION

1.1 About OPENFIELD Ecological Services

OPENFIELD Ecological Services is headed by Pádraic Fogarty who has worked for over 15 years in the environmental field and in 2007 was awarded an MSc from Sligo Institute of Technology for research into Ecological Impact Assessment (EcIA) in Ireland. Pádraic has a primary degree in Analytical Science from DCU, and diplomas in Field Ecology (UCC), Environment and Geography (Open University) and Environmental Protection (IT Sligo). Since its inception in 2007 OPENFIELD has carried out numerous EcIAs for Environmental Impact Assessment (EIA), Appropriate Assessment under the EU Habitats Directive, as well as individual planning applications. Pádraic is a full member of the Institute of Environmental Management and Assessment (IEMA) and an affiliate member of the Institute of Ecology and Environmental Management (IEEM).

1.2 Protection of biodiversity

Biodiversity is a contraction of the words 'biological diversity' and describes the enormous variability in species, habitats and genes that exist on Earth. It is an integral component of our heritage while also providing food, building materials, fuel and clothing, maintaining clean air, water, soil fertility and pollinating crops. A study by the Department of Environment, Heritage and Local Government placed the economic value of biodiversity to Ireland at €2.6 billion annually (Bullock et al., 2008) for these 'ecosystem services'.

All life depends on biodiversity and its current global decline is a major challenge facing humanity. In 1992, at the Rio Earth Summit, this challenge was recognised by the United Nations through the Convention on Biological Diversity which has since been ratified by 193 countries, including Ireland. Its goal to significantly slow down the rate of biodiversity loss on Earth has been echoed by the European Union, which set a target date of 2010 for *halting* the decline. This target was not met but in 2010 in Nagoya, Japan, governments from around the world set about redoubling their efforts and issued a strategy for 2020 called 'Living in Harmony with Nature'. In 2011 the Irish Government incorporated the goals set out in this strategy, along with its commitments to the conservation of biodiversity under national and EU law, in the second national biodiversity action plan (Dept. of Arts, Heritage and the Gaeltacht, 2011).

In Europe, the main policy instruments for conserving biodiversity have been the Birds Directive of 1979 and the Habitats Directive of 1992, which are transposed into Irish law through the European Union (Natural Habitats) Regulations SI94/1997 (as amended by SI233/1998 & SI378/2005). This legislation requires member states to designate areas of their territory that are important for certain listed habitats and species other than birds in the case of the Habitats Directive, and species or significant gatherings of birds in the case of the Birds Directive. These areas are known as Special Areas of Conservation (SAC) and Special Protection Areas (SPA) respectively. Together SACs and SPAs form the Natura 2000 network of protected sites.

Unlike traditional nature reserves or national parks, Natura 2000 areas are not 'fenced-off' from human activity and are frequently in private ownership. It is the responsibility of the competent national authority to ensure that 'favourable conservation status' exists for their SACs and SPAs including that Article 6(3) of the Habitats Directive is met. Article 6(3) requires that an 'appropriate assessment' (AA) be carried out for those areas where projects, plans or proposals are likely to have an effect. In some cases this is obvious from the start, for instance where a road is to pass through a designated area. However, where this is not the case, a preliminary screening must first be carried out to determine whether or not the full AA is required. A Natura Impact Statement (NIS) gathers the necessary data to allow such an assessment to be carried out.

1.3 Methodology

The assessment was carried out in accordance with the following methodologies and guidelines:

1. 'Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC' (Oxford Brookes, 2001). Annex 2 of this document sets out an assessment template that is used in this report. Reference is also made to recently published guidelines 'Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities' (Dept. of Environment, Heritage and Local Government, 2009).
2. 'Appropriate Assessment of Plans and Projects in Ireland. Guidance for Planning Authorities' (DOEHLG 2009).

Note: Reference from this point forth to the 'site' indicates the development site and not the SAC.

In accordance with the above mentioned guidance notes, the following steps are followed:

Step 1: Analysis of the SAC
This involves assessing the current status of the SAC and underlying trends affecting it. This is done through a combination of literature review, site survey, and consultation with relevant stakeholders.

Step 2: Analysis of the proposed development
Identifying aspects of the plan that may effect the integrity of the SAC

Step 3: Analysis of other plans and projects
Identifying aspects of other plans or projects that may act 'in combination' with the proposed development to effect the integrity of the SAC

Step 4: Determination of significance
Determination whether any of these effects, either alone or in combination with other plans and projects, will be significant.

The AA process is an iterative one where the NIS actively identifies potential effects, the project is then modified to avoid or mitigate these effects, and then the new project design is re-assessed until such point as no significant effects are predicted to occur. It is important to note that any 'appropriate assessment' is carried out by the competent authority (in this case Kilkenny County Council) and this NIS has been prepared in order to aid that decision.

2.0 Step 1 – Analysis of the Natura 2000 network

2.1 Site location and extent

The Connolly Redmills plant is located in the townland of Grange Lower, approximately 500m north of the town of Goresbridge, County Kilkenny. This location is shown in figure 1 which also shows its position in relation to the boundary of nearby SACs. Figure 2 shows the site boundary.

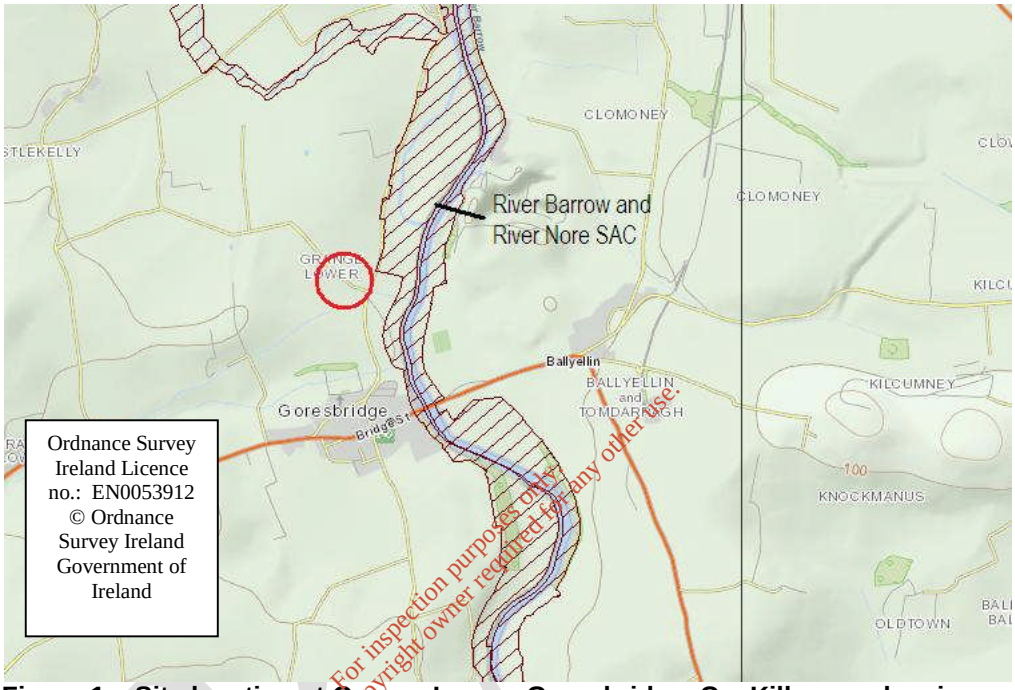

Figure 1 – Site location at Grange Lower, Goresbridge, Co. Kilkenny showing boundary of SAC (in diagonal lines) (from www.npws.ie)

There is no prescribed radius around a site for determining what Natura 2000 sites should be studied. This is determined by the zone of influence of the project although a preliminary radius of 2km is usually examined (IEA, 1995). Within this area there is one Natura 2000 area. Figure 1 shows the proximity of the plant to the River Nore and River Barrow SAC. It shows that that plant is adjacent to the boundary of the SAC and is approximately 200m from the bank of the River Barrow. Figure 2 shows the site of the proposed development and this is within the SAC boundary. Aerial photography suggests the presence of agricultural fields and drainage ditches in this location.

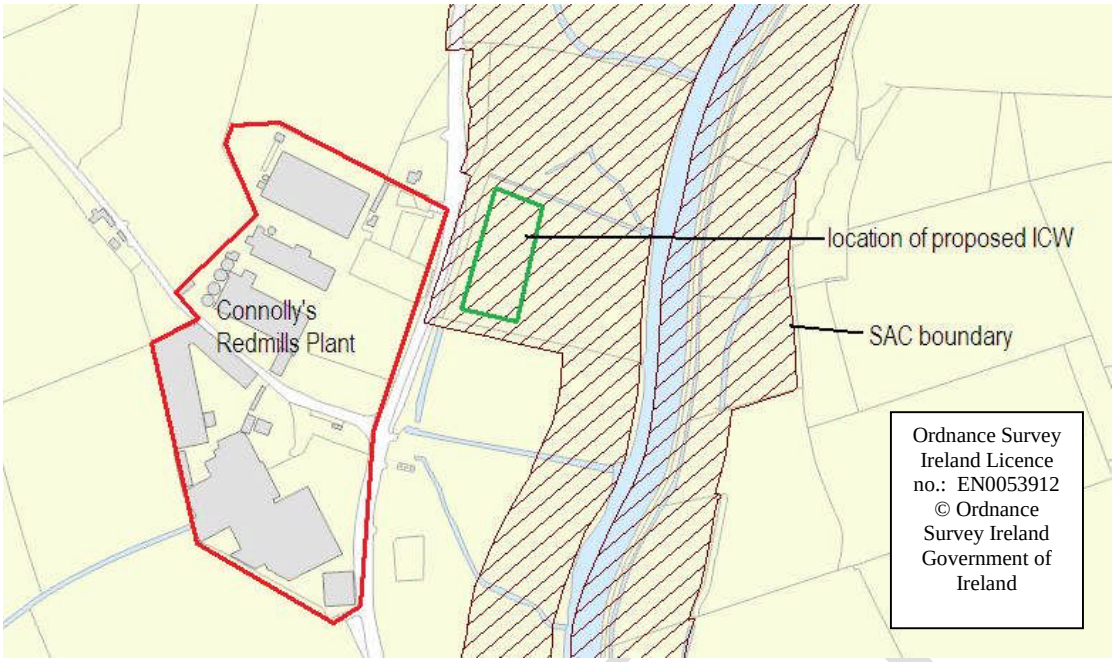

Figure 2 – Plant location (in red) and indicative site of ICW (in green) from www.npws.ie showing the extent of the SAC boundary

2.2 River Barrow & River Nore SAC (site code: 2162)

The rivers Barrow and Nore are among the longest rivers in Ireland and this large SAC stretches from the Slieve Bloom mountains in the north to Creadun head in county Wexford in the south. A site synopsis of the SAC is available from the NPWS and can be viewed by following this link: http://www.npws.ie/media/npwsie/content/images/protectedsites/sitesynopsis/SY002162.pdf .

The River Barrow and River Nore drain a large part of the low-lying areas of Leinster and are important rivers for a wide range of aquatic or semi-aquatic habitats and species.

The reasons why the River Barrow and River Nore is an SAC are set out in the its 'qualifying interests' and these are given in table 1. Whether the integrity of the SAC is likely to be significantly affected must be measured against its conservation objectives. Site specific conservation objectives have been recently set (NPWS, 2011). This document sets specific objectives for each of the qualifying interests of the SAC. While it is not necessary to reproduce these in their entirety here the full text can be found by following this link:
www.npws.ie/protectedsites/specialareasofconservationsac/riverbarrowandrivernoresac/

Table 1 – Qualifying interests of the River Barrow and River Nore SAC

Aspect	Level of Protection	NPWS Assessment
Alluvial wet woodland (code: 91E0)	Habitats Directive Annex I priority	Bad
Old oak woodlands (code: 91A0)		Bad

Atlantic salt meadows (code: 1330)	Habitats Directive Annex I	Poor
Mediterranean salt meadows (code: 1410)		Poor
Petrifying springs with tufa formation (code: 7220)		Bad
Eutrophic tall herbs (code: 6430)		Poor
Floating river vegetation (code: 3260)		Bad
Estuary (code: 1130)		Poor
Salicornia mudflats (code: 1310)		Poor
Dry heath (code: 4030)		Poor
Tidal mudflats (code: 1140)		Poor
Spartina awards (code: 1320)		Poor
Sea Lamprey *Petromyzon marinus* (Code: 1095)	Habitats Directive Annex II	Poor
Brook Lamprey *Lampetra planeri* (Code: 1099)		Good
Semi-aquatic snail *Vertigo moulinsiana* (Code: 1016)		Bad
River Lamprey *Lampetra fluviatilis* (Code: 1096)	Habitats Directive Annex II, V	Good
Freshwater Pearl Mussel *Margaritifera margaritifera* (Code: 1029)		Bad
Nore freshwater pearl mussel *Margaritifera margaritifera durrovensis* (Code: 1990)		Bad
Freshwater Crayfish *Austropotamobius pallipes* (Code: 1092)		Poor
Twaite Shad *Alosa fallax fallax* (Code: 1103)		Bad
Atlantic Salmon *Salmo salar* (Code: 1106)		Bad
Otter *Lutra lutra* (Code: 1355)		Poor
Killarney fern *Trichomanes speciosum* (Code: 1421)		Good
Allis shad *Alosa alosa* (Code: 1102)		Unknown

The NPWS assessment refers to the status of protected habitats and species that was carried out for the European Commission in 2008 (NPWS, 2008).

This gives the status of the feature at a national level and does not necessarily refer to the status of a habitat or feature within the River Barrow and River Nore SAC.

In a generic sense 'favourable conservation status' of a habitat is achieved when:
• its natural range, and area it covers within that range, are stable or increasing, and
• 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.

While 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.

These principles are reflected in the site specific conservations objectives for this SAC.

2.3 Literature Review

A synopsis report has been published for the SAC and it gives a broad description of the designated area as well as discussing the SAC's qualifying interests and other features of ecological importance.

Within the general area of the site the boundary of the SAC encompasses the riparian zone along the River Barrow as well as adjacent fields. Knowing why these fields are included within the boundary of the SAC is critical in determining whether significant effects may arise as a result of this project.

The maps included with the published Conservation Objectives show the location of key habitats that are listed as qualifying interests (table 1). These maps show that none of these habitats is recorded from the site location. It also shows that certain key species: Demoulin's Whorl Snail, Killarney Fern and the Nore Freshwater Pearl Mussel are not recorded from this site. There is a record for the White-clawed Crayfish on the Barrow and they can be assumed to be present throughout the main channel of the Barrow. This is an aquatic invertebrate and would be confined to the river itself. The River Barrow is within the range of the Lamprey species, Atlantic Salmon and Otter. The Allis and Twaite Shad are confined to estuarine areas and so will not be found within this portion of the Barrow (NPWS, 2008).

It is likely that the proposed ICW site, and adjacent fields, are included within the SAC boundary as they are a part of the Barrow's floodplain.

2.4 Consultation

A written request for nature conservation observations was made to the National Parks and Wildlife Service (NPWS) via the Development Applications Unit on November 2nd 2012 (reference number: G Pre00428/2012). It was stated that a response would be forthcoming by December 14th.

The views of Inland Fisheries Ireland (IFI) were also sought and details of the project were sent to Mr Frank O'Donoghue, regional environmental officer. Mr O'Donoghue responded by email on November 13th:

Dear Mr Fogarty,

Inland Fisheries Ireland (IFI) welcomes the installation of systems intended to treat wastewaters and improve the quality of discharges to the environment. IFI is not in principle opposed to the proposed development. However, we would expect that the application should satisfy the criteria detailed in the November 2010 publication "Department of the Environment, Heritage and Local Government, Integrated Constructed Wetlands, Guidance Document for Farmyard Soiled Water and Domestic Wastewater Applications". We would also expect the application to include a site assessment form similar to that in appendix c of the above publication.

Discharges to waters of polluting matter such as silt and fuel oils can arise during the construction phase of such developments. The discharge of silt-laden waters to fisheries streams due to insufficient silt control measures can clog salmonid (salmon and trout) spawning beds and can also precipitate further riverbank erosion downstream. Inevitably this can lead to loss or degradation of valuable habitat. It is important to incorporate best practices and strategies to minimise discharges of silt/suspended solids to waters. Silt traps if appropriate should be constructed at locations that will intercept run-off from the site.

Fuel oils etc. should be stored on a sheltered dry elevated site well removed from aquatic zones. It is our view that refuelling of vehicles should take place in a designated area well away from aquatic zones and fuel oils must not, under any circumstances, discharge into an aquatic zone.

We look forward to receiving and reviewing the planning application and associated Natura Impact Assessment in due course.

Yours sincerely,

Frank O'Donoghue

2.5 Site Survey

2.5.1 Methodology

The site was surveyed in accordance with the Heritage Council's *Habitat Survey guidelines* (Smith et al., 2010). Habitats were identified in accordance with Fossitt's Guide to Habitats in Ireland (Fossitt, 2000). A full species list for each habitat is presented as an Appendix to this report.

2.5.2 Constraints

A survey of the site was carried out on November 6th 2012 and this is outside the optimal period for general habitat survey (Smith et al., 2010). For a study of this nature it is essential that pathways are identified between the project and the SAC in question. In this regard a full assessment can generally be made during any season.

2.5.3 Survey results

The proposed location of the ICW is within an area of **improved agricultural grassland – GA1**. This field is predominantly composed of grasses including Cock's-foot *Dactylis glomerata* with occasional Thistles *Cirsium sp.,* Common Nettle *Urtica dioica* and Creeping Buttercup *Ranunculus repens.* This habitat is of low biodiversity value and is not associated with the conservation interests of the SAC listed in table 1.

Surrounding this field there is a tall **treeline – WL2** that is composed of Ash *Fraxinus excelsior,* Hawthorn *Crataegus monogyna,* Brambles *Rubus fruticosus agg.* and Ivy *Hedera helix.* Trees occurring in lesser abundance include Horse Chestnut *Aesculus hippocastanum,* European Larch *Larix decidua.* Oak *Quercus sp.* and Spindle *Euonymus europaeus.* Running parallel to these treelines there is a series of **drainage ditches – FW4**, some of which are up to 1m wide. Of particular note here is the presence of the alien invasive species Water Fern *Azolla filiculoides*. Invasive Species Ireland describes this as one of our 'most unwanted' established threats (see http://invasivespeciesireland.com/most-unwanted-species/established/freshwater/water-fern).

All habitats are within the SAC boundary but none is an example of those listed in table 1 and there is no suitable habitat for species which are qualifying interests of the SAC. Treeline and ditch habitats are however of high local value for biodiversity. It is considered that this area is within the SAC boundary as it is a part of the floodplain of the Barrow River. The main channel of the River flows to the south of the field in question. Here it is broad and slow moving while there is little vegetation along the riparian zone.

During the site survey a small number (6) of Whooper Swans *Cygnus cygnus* were seen to be grazing in a field adjacent to the subject site. Whooper Swans are winter visitors to Ireland and are protected under Annex I of the Birds Directive. They are of medium conservation concern (Lynas et al., 2007) but increases in the all-island population have been recorded in recent years (Boland et al., 2010). A national census carried out in January 2010 did not record Whooper Swans in this area of the Carlow/Kilkenny border. Local

knowledge (E. Brennan pers. comm.) indicates that swans are present every year but this does not distinguish between Whooper Swans and the more common, less protected Mute Swan *Cygnus olor,* which was also present in this field during the site survey.

Effluent run-off is currently being treated in soakpit on the site. Permission for this was granted by Kilkenny County Council using a Section 12 Notice, as a temporary measure to prevent a pollution incident during the 2012 harvest season.

An indicative habitat map is shown in figure 3.

Figure 3 – Indicative habitat map showing proposed location of ICW.

2.6 Trends affecting the SAC

The bulk of the River Barrow and River Nore SAC is made up of lowland rivers and their associated riparian habitats.

The habitats and species listed in table 1 (qualifying interests) were all assessed by the NPWS as part of Ireland's reporting requirements to the European Commission (NPWS, 2008). As can be seen from this table only three of out the 24 qualifying interests were assessed as 'good'. While the reasons for the 'bad' and 'poor' assessments vary one of the greatest pressures on the SAC can be said to be pollution in the form of eutrophication (i.e. too much nutrient in the form of phosphates and nitrates). The Environmental Protection Agency (EPA) states that 48% of river water bodies are of 'moderate', 'poor', or 'bad' ecological status (EPA, 2012).

Water quality is a crucial element in the conservation of the Rivers Barrow and Nore. The EPA monitors the biological quality of rivers in Ireland. The Barrow River flows originates in the Slieve Bloom Mountains and is one of the largest rivers in the Ireland. In this area its ecological status is assessed as 'moderate', indicating unsatisfactory conditions under the Water Framework Directive (WFD). These data are taken from www.epa.ie. The WFD requires 'good ecological status' of all waters by 2015 and where the status is 'poor' or 'moderate' remedial measures are required.

The site is located within the Barrow Main Water Management Unit (WMU), within the South East River Basin District. The action plan for this WMU indicates the principle pressures on water quality are nitrate run-off, point pollution sources, and on-site treatment systems.

The Freshwater Pearl Mussel *Margaritifera margaritifera* is a species of global significance being one of the few animals found in Ireland to appear on the Red List of the International Union for the Conservation of Nature (IUCN, 2012). The Nore Freshwater Pearl Mussel *M. durrovensis* is recognised as a distinct species that is endemic to Ireland. It is critically endangered with extinction historically due to harvesting for its pearl but more recently due to deterioration in water quality throughout its range (Moorkens, 1999; Byrne et al., 2009). *M. durrovensis* is only present along a 15km stretch of the upper River Nore. There are no known populations of Freshwater Pearl Mussel in the main channel of the Barrow.

3.0 Step 2 – Analysis of the Project

The project involves the construction and operation of an Integrated Constructed Wetland (ICW) on the proposed site to treat run-off from a yard within the Connolly's Redmills plant. The effluent is composed of the decomposition by-products of spilled grain and seeds which are subsequently washed into drains. Since July 2012 this effluent has been treated in a soak pit at the proposed ICW location.

This proposal will see the construction of three cells with wetland vegetation. ICWs are well-proven in their effectiveness for treating organic-based effluent on small to medium scales (USEPA, 1993). Figure 4 shows the layout of the ICW.

In 2010 the Irish Government published a guidance note on the use of IWCs for farmyard soiled water and domestic wastewater applications (DoEHLG, 2010).

The construction process will ensure that no interference with treelines or drainage ditches will occur and a minimum separation distance of XXm will be in place between these features.

The construction phase will result in the loss of low biodiversity value improved agricultural grassland to be replaced by a wetland system of native species such as Common Reed *Phragmites australis* and Sedges *Carex sp.* This is likely to provide habitat for a number of species including amphibians, birds and invertebrates – thus enhancing the overall biodiversity value of the site.

The assimilative capacity calculations show that the final emission limit values will be in accordance with the S.I. 272 Surface Water Regulations 2009.

The discharge point will be to a drainage ditch which feeds into the River Barrow some 130m downstream.

The presence of the Water Fern is a cause for concern as it may establish itself in the ICW and may be spread further afield on machinery etc. It is currently recorded by the National Biodiversity Data Centre from the lower reaches of the River Barrow but is absent from the nearby Nore and Slaney rivers.

Being located within a flood plain it is essential that the ICW does not become flooded, which would wash untreated effluent into the Barrow River. The design shows however that overtopping of the wetland is unlikely to occur during a 1 in 100 year flood event.

There will be no impact upon the adjacent field in which Whooper Swans were noted and so negative effects to these species are unlikely.

4.0 Step 3 – Analysis of Other Plans and Projects

Individual impacts from one-off developments or plans may not in themselves be significant. However, these may become significant when combined with similar, multiple impacts elsewhere. These are sometimes known as cumulative impacts but in AA terminology are referred to as 'in combination' effects.

In terms of the conservation objectives of the SAC identified in section 2.2, maintaining the extent and condition of important habitats and species populations is vital.

The South Eastern River Basin District Management Plan (SERBDMP) was published under the EU's Water Framework Directive. This sets out to attain 'good ecological status' of all water bodies by 2015. It includes a 'programme of measures' that will address point or diffuse pressures on water quality. It has already been seen that the status of the Barrow main channel is 'moderate' and there are a number of point and diffuse pollution sources.

This proposal will treat an existing discharge to a standard that is in accordance with the 2009 Surface Water Regulations. It will therefore contribute to the measures that are underway to attain 'good ecological status' throughout the catchment.

The impacts that this project will have on flooding patterns along the Barrow are unknown at present.

5.0 Step 4: Determination of Significance

5.1 Impact prediction

Under Article 6 of the Habitats Directive the term 'significance' is taken to mean an effect on the integrity of the SAC. Unlike Environmental Impact Assessment for instance, there are no degrees of significance and where an effect is determined to be significant mitigation or avoidance measures must be considered.

In order for an impact to occur there must be a pathway between the development (the source) and the SAC or SPA (the receptor). Where a pathway does not exist then an impact cannot occur.

The subject site is located within the boundary of the River Barrow and River Nore SAC. There are no other Natura 2000 areas within the zone of influence of this project.

This development will not result in the loss of habitat or direct impacts to habitats that are qualifying interests of the SAC (see table 1). It will not affect the natural range or area of any of these habitats and nor will it affect the conservation status of 'typical species' found therein. In this regard it can be said that it will not directly affect the conservation interests for habitats.

There are no suitable habitats on the site for species that are qualifying interests for the SAC. The nearby River Barrow is assumed to be home to a number of these however including Atlantic Salmon, Lampreys, Otter and Freshwater Crayfish. There will be no interference with the riparian zone along the Barrow and no in-stream works will be undertaken. This development will therefore not reduce the natural range any species listed in table 1 and nor will it affect their population dynamics. It can therefore be concluded that this development will not impact upon the conservation objectives of any of the species that are qualifying interests for the SAC.

The construction phase has the potential to release pollutants, such as sediment, into ditches that drain to the River Barrow. This impact is potentially significant.

The construction phase could result in the disturbance of the alien invasive Water Fern. This is unlikely to negatively affect the main channel of the Barrow as it is not tolerant of moving water. It could be transferred to other catchments however by being carried on machinery. The nearby Rivers Nore and Slaney are both designated as SACs.

There will be a positive impact to water quality in the Barrow arising from the operation phase of this development that will act in combination with other measures under the Water Framework Direcitve.

There will be no loss of treeline or drainage ditch habitat as part of this project and these locally important habitats will be protected throughout the construction phase. They can be damaged permanently through the compaction of soil around the Root Protection Zone (RPA). This can occur through the movement of machinery or the storage of heavy materials. This is a potentially significant effect.

From the site survey and the literature review (however in the absence of detail from the NPWS) it can be concluded that this site is included within the boundary of the SAC because it is within the floodplain of the Barrow. Flooding is a natural part of a river's dynamic and any action that prevents flooding can detrimentally affect the structure and functioning of habitats elsewhere along the river. In this way conservation interests of the SAC can be affected and it is for this reason that floodplains are included within the boundary of many fluvial SACs.

This site is known to flood however the impact of this project upon flood patterns in the immediate vicinity are unknown.

5.1 Summary

This analysis has found that significant effects are likely to arise to the integrity of the Natura 2000 network as a result of certain aspects of this project. Mitigation is therefore required to ensure that no negative effect remains in the final version of the project.

6.0 Avoidance or Mitigation

Potential significant effects must be avoided or mitigated in order to maintain the integrity of the SAC. Where this is not possible, the development can only proceed for Imperative Reasons of Overriding Public Interest (IROPI). This must be done in consultation with the Minister for the Environment, Heritage and Local Government, be accompanied by compensatory measures to maintain the overall coherence of the Natura 2000 network, and can only proceed with the approval of the European Commission. In addition, it must be demonstrated that all alternative options have been considered – including not proceeding with a plan at all.

In this instance three significant effects are predicted to occur to the integrity of the Natura 2000 network and so further mitigation measures are required.

6.1 Pollution during the construction phase

Negative affects can be avoided through good site management and by following the guidance issued by the Eastern Regional Fisheries Board (since IFI). (ERFB, unknown year).

Recommendation 1:
The recommendations as outlined in the ERFB document should be followed:

1. Fuels, oils, greases and hydraulic fluids must be stored in bunded compounds well away from drainage ditches. Refuelling of machinery, etc., should be carried out in bunded areas.
2. Runoff from machine service and concrete mixing areas must not enter drainage ditches.
3. Stockpile areas for sands and gravel should be kept to minimum size, well away from the drainage ditches.

4. Runoff from the above should only be routed to the watercourse via suitably designed and sited settlement ponds/filter channels.
5. Settlement ponds should be inspected daily and maintained regularly.
6. Temporary crossings should be designed to the criteria laid down for permanent works [not relevant in this case].
7. Watercourse banks should be left intact if possible. If they have to be disturbed, all practicable measures should be taken to prevent soils from entering the watercourses. [not relevant as drainage ditches to be conserved].

6.2 Damage to root zones of trees

Recommendation 2:
No works, storage or movement of machinery should occur within the root protection zone of the treelines. This is typically marked by the extent of the trees' canopy but can also be calculated using a formula from the National Roads Authority (NRA, unknown year):

$$RPA(m^2) = \pi \left(\frac{\text{stem diameter, mm} \times 12}{1{,}000} \right) 2$$

The RPA gives the area around which there should be no disturbance or compaction of soil. It is recommended that this be calculated for the largest tree within each treeline. Prior to construction this area should be clearly marked and instruction given to construction personnel not to disturb this buffer zone.

6.3 Spread of Water Fern

Recommendation 3
These general guidelines are given on the Invasive Species Ireland web site:

Inspect – remove – dispose – report. Removing build up of plants from equipment is effective at preventing the opportunity of colonisation by invasive species. To prevent the spread of invasive species ensure you always follow these guidelines:

- Clean all parts of equipment that comes into contact with water.
- Remove any visible plant matter and mud.
- Do not move fouled equipment from one area to another without thoroughly cleaning it.
- Watch out for hitchhikers on ropes and chains.

7.0 Conclusion

This site is within the boundary of the River Barrow and River Nore SAC. This assessment has concluded that with mitigation significant effects are not likely to occur as a result of this project upon the integrity of the River Barrow and River Nore SAC or the wider Natura 2000 network.

8.0 REFERENCES

Boland H., McElwaine J.G., Henderson G., Hall C., Walsh A. & Crowe O. 2010. *Whooper* Cygnus Cygnus *and Bewick's* C. columbianus *Swans in Ireland: results of the International Swan Census, January 2010.* Irish Birds Volume 9 Number 1 pg1-10.

Bullock C., Kretch C. & Candon E. 2008. *The Economic and Social Aspects of Biodiversity*. Stationary Office.

Byrne, A., Moorkens, E.A., Anderson, R., Killeen, I.J. & Regan, E.C. 2009. *Ireland Red List No. 2 – Non- Marine Molluscs.* National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin, Ireland.

Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora

Council Directive 97/11/EEC of 3rd March 1997 amending Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment

Department of Arts, Heritage and the Gaeltacht. 2011. *Actions for Biodiversity 2011 – 2016. Ireland's National Biodiversity Plan.*

Department of the Environment, Heritage and Local Government. 2010. *Integrated Constructed Wetlands: Guidance Document for Farmland Soiled Water and Domestic Wastewater Applications.*

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

DG Environment. 2003. *Interpretation Manual of European Union Habitats.* European Commission.

EPA. 2012. *Ireland's Environment – An Assessment.* Published by the Environmental Protection Agency, Ireland.

Fossitt J. 2000. *A Guide to Habitats in Ireland*. Heritage Council.

Greenhalgh M. & Ovenden D. 2007. *Freshwater Life.* Collins.

IEEM. 2006. *Guidelines for Ecological Impact Assessment in the United Kingdom.* Institute of Ecology and Environmental Management.

Institute of Environmental Assessment, 1995. *Guidelines for Baseline Ecological Assessment*'

IUCN. 2012. *IUCN Red List of Threatened Species. Version 2012.1*. www.iucnredlist.org. Downloaded on 30 June 2012.Assessment'

Moorkens E. A.. 1999. *Conservation Management of the Freshwater Pearl Mussel* Margaritifera margaritifera*. Part 1: Biology of the species and its present situation in Ireland. Irish Wildlife Manuals, No. 8.* Dúchas, The Heritage Service.

National Parks and Wildlife Service. 2008. *The Status of EU Protected Habitats and Species in Ireland.* Department of Environment, Heritage and Local Government.

National Parks and Wildlife Service. 2006. *Site Synopsis: River Barrow and River Nore Special Area of Conservation.* Department of Environment, Heritage and Local Government.

NPWS. 2011. *Conservation Objectives: River Barrow and River Nore SAC 002162. Version 1.0*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Lucy J. 2009. *Water Quality in Ireland 2007-2008.* EPA

Lynas P., Newton S.F., & Robinson J.A. 2007. *The Status of birds in Ireland: an analysis of conservation concern 2008 – 2013.* Irish Birds: Volume 8; Number 2.

Oxford Brookes University. 2001. *Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC.* European Commission, Environment DG.

Smith G. F., O'Donoghue P., O'Hora K. and Delaney E. 2010. *Best Practice Guidance for Habitat Survey and Mapping.* Heritage Council.

Toner P., Bowman J., Clabby K., Lucey J., McGarrigle M., Concannon C., Clenaghan C., Cunningham P., Delaney J., O'Boyle S., MacCárthaigh M., Craig M. & Quinn R. 2005. *Water Quality in Ireland 2001 – 2003.* Appendix 1: Biological and Physico-Chemical Surveillance and Water Quality Assessment of Rivers. EPA.

United States Environmental Protection Agency. 1993. *Subsurface Flow Constructed Wetlands For WasteWater Treatment: A Technology Assessment.* EPA 832-R-93-008

Appendix 1 – List of species

The nomenclature for vascular plants is taken from the *New Flora of the British Isles* (Stace, 2010). Scientific names for mosses comes from *A Checklist and Census Catalogue of British and Irish Bryophytes* (Hill et al., 2008) while common names are taken from *Mossess and Liverworts of Britain and Ireland* (Atherton et al. eds., 2010).

Species indicated with an asterisk '*' are known to have been introduced to Ireland by humans.

Species relative abundance is subjectively assessed using the DAFOR scale: D = Dominant; A = Abundant; F = Frequent; O = Occasional; R = Rare

Treeline - WL2		**DAFOR**
*Aesculus hippocastanum**	Horse-chestnut	O
Anthriscus sylvestris	Cow Parsley	O
Cirsium arvense	Creeping Thistle	O
Crataegus monogyna	Hawthorn	F
Euonymus europaeus	Spindle	R
Fraxinus excelsior	Ash	F
Galium aparine	Cleavers	F
Geranium robertianum	Herb-Robert	O
Geum urbanum	Wood Avens	O
Hedera helix	Common Ivy	F
*Larix decidua**	European Larch	R
Potentilla reptans	Creeping Cinquefoil	O
Prunus spinosa	Blackthorn	O
Quercus sp.	Oak	R
Ranunculus repens	Creeping Buttercup	O
Rosa sp.	Roses	O
Rubus fruticosus agg.	Brambles	F
Torilis japonica	Upright Hedge-parsley	O
Urtica dioica	Common Nettle	O
Viburnum opulus	Guelder-rose	O

Drainage Ditch - FW4		**DAFOR**
Lemna sp.	Duckweeds	O
Callitriche sp.	Water-starworts	O
Phalaris arundinacea	Reed Canary-grass	O
Nasturtium officinale	Water-cress	O
Lythrum salicaria	Purple-loosestrife	O
Azolla filiculoides	Water Fern	R-D

Improved Agricultural Grassland - GA1		**DAFOR**
Cirsium arvense	Creeping Thistle	O
Cirsium vulgare	Spear Thistle	O
Dactylis glomerata	Cock's-foot	F
Filipendula ulmaria	Meadowsweet	O
Grasses		D
Ranunculus repens	Creeping Buttercup	O
Urtica dioica	Common Nettle	O