REFERENCE DOCUMENTS for PROPOSED LARGER TURBINES AND MET MASTS AT UPPERCHURCH WINDFARM for EIAR 2021 and AA 2021

REFERENCE DOCUMENT 31 of 36

This document contains the following:

UWF Replacement Forestry

- **2018 Natura Impact Statement for Whole UWF Project Elements 1 to 5 – Volume D1 (Volume 1 of 6)**
  - Natura Impact Statement for Whole UWF Project Elements 1 to 5
  - Appendix A1: European Site Synopsis
  - Appendix A2: European Site Conservation Objectives
  - Appendix A3: Finding of No Significant Effects (FONSE) Report
  - Appendix A17: UWF Grid Connection HDD Risk Assessment
  - Appendix A18: Planting Concealed Roads Methodology

Reference

VOLUME D: APPROPRIATE ASSESSMENT REPORTING

Whole Upperchurch Windfarm Project

Natura Impact Statement
for
Whole UWF Project Elements 1 to 5

May 2018

Volume D1 (Volume 1 of 6)

Natura Impact Statement for Whole UWF Project Elements 1 to 5
Appendix A1: European Site Synopsis
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Whole Upperchurch Windfarm Project
Natura Impact Statement for Whole UWF Project Elements 1 to 5

Project Location:

Co. Tipperary and Co. Limerick

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A18	Vegetation Reinstatement Methodology along Concealed Roads (Dr. Mary O'Connor)

REFERENCE DOCUMENT

1 INTRODUCTION

1.1 Project Background

This Natura Impact Statement has been prepared by Inis Environmenmtal Consultants to accompany applications by Ecopower Developments Limited to the relevant Competent Authorities for three elements of the Whole Upperchurch Windfarm Project - UWF Grid Connection (GC), UWF Related Works (RW) and UWF Replacement Forestry (RF), (see Table 1.1).. The Whole Upperchurch Windfarm Project (Whole UWF Project) also includes the already consented Upperchurch Windfarm (UWF), in addition to UWF Other Activities (OA). The project therefore comprises five Individual Project Elements in total (see Table 1.1).

In compliance with the provisions of Article 6 of the Habitats Directive, as implemented by Part XAB of the Planning and Development Act 2000, as amended, in circumstances where a proposed plan or project is likely to have a significant effect on a European (EU or Natura 2000) site, either individually or in combination with other plans or projects, an Appropriate Assessment (AA) must be undertaken by the competent authority of the implications for the site in view of the site's conservation objectives.

As part of the AA process as defined by the European Communities (Birds and Natural Habitats) Regulations (S.I. 477 of 2011), and pursuant to guidance issued by the National Parks and Wildlife Service (NPWS) of the Department of Culture, Heritage and the Gaeltacht, this Natura Impact Statement contains information which permits a Competent Authority to conduct an Appropriate Assessment in respect of the individual Project Elements (numbered 1-5) but also the Whole UWF Project.

The Upperchurch Windfarm element of the Whole UWF Project has already been subject to Appropriate Assessment by An Bord Pleanála and therein considered, either individually or in combination with other plans and projects, to not result in adverse effects on the integrity of a European Site[1]. It is recognised that individual Elements presented for appraisal in the current applications and detailed in this NIS may have the potential for in combination effects with the Upperchurch Windfarm on European Sites. Therefore, further consideration is herein given to whether those proposed Elements either alone or in combination with the Upperchurch Windfarm, as the Whole UWF Project, will result in adverse effects on the integrity of any European Site.

As the UWF Other Activities will be carried out as part of the Whole UWF Project information on these activities is also required within Appropriate Assessment reporting and presented herein accordingly.

A full description of all Elements of the Whole UWF Project is available in **Appendix A4-A8 of this NIS** and summarised below in Table 1.1.

[1] An Bord Pleanála (2014) Inspectors Report for Upperchurch Windfarm Project PL22.243040.

REFERENCE DOCUMENT

Table 1-1: Definition of the Individual Project Elements of the Whole UWF Project

Individual Elements of the Whole UWF Project	Overview of each Individual Project Element	Planning Status and Competent Authority
UWF Grid Connection	Mountphilips Substation, Mountphilips – Upperchurch 110kV UGC UWF Grid Connection Access Roads UWF Grid Connection Ancillary Works	Current planning application to An Bord Pleanála
UWF Related Works	Internal Windfarm Cabling, Realigned Windfarm Roads Haul Route Works Telecoms Relay Pole RW Ancillary Works	Current planning application to Tipperary County Council
UWF Replacement Forestry	Replacement Forestry at Foilnaman	Current afforestation license application to the Minister for Agriculture, Food and the Marine
Upperchurch Windfarm	Consented UWF Turbines Consented UWF Substation Consented UWF Roads UWF Ancillary Works	Already consented under Planning Reference: Tipperary Co.Co. 13/51/0003, ABP PL22.243040
UWF Other Activities	Haul Route Activities Upperchurch Hen Harrier Scheme Monitoring Activities Overhead Line Activities	No planning permission required.

1.2 Legislative Context

The EU Habitats Directive (92/43/EEC) on the Conservation of Natural Habitats and of Wild Fauna and Flora formed a basis for the designation of Special Areas of Conservation (SACs). Similarly, Special Protection Areas are legislated for under the Birds Directive (Council Directive 2009/147/ECon the Conservation of Wild Birds). Collectively SACs and SPAs are referred to as Natura 2000 sites, or 'European' sites. In general terms, they are considered to be of exceptional importance in terms of rare, endangered or vulnerable habitats and species within the European Community.

Under Article 6(3) of the EU Habitats Directive an Appropriate Assessment (AA) must be undertaken by the competent authority in respect of any plan or project that is likely to have a significant effect on a Natura 2000 site, in view of that site's conservation objectives. These requirements have been transposed into Irish legislation by the European Communities (Birds and Natural Habitats) Regulations (S.I. 477 of 2011).

The statutory agency responsible for Natura 2000 sites is the National Parks and Wildlife Service (NPWS) of the Department of Culture, Heritage and the Gaeltacht (DCHG).

In December 2009 "Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities, Department of the Environment, Heritage and Local Government" was published. This guidance document was prepared by the NPWS (DoEHLG, 2010), with input from local authorities. Previously, in 2001, the European Commission issued a guidance document. This NIS has been prepared in accordance with the relevant Irish and European Commission Guidance.

REFERENCE DOCUMENT

1.3 Appropriate Assessment Process

There are four stages in an Appropriate Assessment (AA), as outlined in the European Commission Guidance document (2001). The following is a brief summary of these steps, however there is no reliance placed on stage 3 and 4 as far as this application for proposed development is concerned.

Stage One - Screening: This stage examines the likely effects of a project either alone or in combination with other projects upon a Natura 2000 site and considers whether it can be objectively concluded that these effects will not be significant.

Stage Two - Appropriate Assessment: In this stage, the impact of the project on the integrity of the Natura 2000 site is considered with respect to the conservation objectives of the site and to its structure and function. Mitigation measures should be applied to the point where no adverse impacts on the site(s) remain.

Stage Three - Assessment of Alternative Solutions: Should the Appropriate Assessment determine that adverse impacts are likely upon a Natura 2000 site, this stage examines alternative ways of implementing the project that, where possible, avoid these adverse impacts. For the avoidance of doubt, the developer does not purport to place reliance on Stage Three.

Stage Four - Assessment where no alternative solutions exist and where adverse impacts remain: Where imperative reasons of overriding public interest (IROPI) exist, an assessment to consider whether compensatory measures will or will not effectively offset the damage to the Natura site will be necessary. European case law highlights that consideration must be given to alternatives outside the project area in carrying out the IROPI test. It is a rigorous test which projects are generally considered unlikely to pass. In any event, the developer does not purport to place any reliance on Stage Four.

In the preparation of this screening assessment and NIS regard has been had to the EU Habitats Directive (92/43/EEC)**, the European Communities (Birds and Natural Habitats) Regulations 2011,** Part XAB of the Planning and Development Act 2000, and with reference to the relevant guidance, in particular:

- 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 2001.
- Managing Natura 2000 Sites: The Provisions of Article 6 of the 'Habitats Directive' 92/43/EEC, European Commission, 2000.
- Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities. National Parks and Wildlife Service, Department of the Environment, Heritage and Local Government, Dublin 2010.

REFERENCE DOCUMENT

1.4 Data Used to Inform this NIS

The supporting ecological receptor information for the appraisal of the proposed Elements are described in full in the respective Biodiversity Chapters (Chapter 8 in each instance) for the UWF Grid Connection planning application to An Bord Pleanála, the UWF Related Works planning application to Tipperary County Council and the UWF Replacement Forestry afforestation application to the Minister for Agriculture, Food and the Marine).

Information on the Best Practice Survey Methods used to inform the above is provided in the respective Appendix to each. The entire above are provided as reference material within Appendices A11-A15 of this NIS.

In addition Environmental Management Plans for both the UWF Grid Connection and the UWF Related Works are provided within Appendices A9 and A10 of this NIS.

1.5 Identification of Potentially Affected European Sites

The first step in the process is to develop a 'long list' of European sites potentially affected by the project. Each European site within a certain distance from the proposed development is reviewed to establish whether or not the project is likely to have a significant effect on the integrity of the site, as defined by its structure and function and, in particular, its conservation objectives.

In accordance with the guidance document 'Appropriate Assessment of Plans and Projects in Ireland: Guidance for Planning Authorities', in the approach to screening, any Natura 2000 site within the zone of impact of a plan or a project should be considered. A distance of 15km is currently recommended in the case of plans. For certain projects, the distance could be much less than 15km but this is evaluated on a case-by-case basis. A distance of 15km was considered appropriate for the likely zone of impact of this project, and includes 23 Natura 2000 sites. The zone of impact should also include Natura 2000 sites further than 15km from a project if the project has the potential to affect water quality or sensitive aspects (including supporting features) of those sites.

REFERENCE DOCUMENT

2 DESCRIPTION OF THE WHOLE UWF PROJECT

2.1 Overview of Whole UWF Project and Individual Project Elements

2.1.1 Whole UWF Project: Purpose, Location and Layout

Overview: The Whole UWF Project comprises the following elements – UWF Grid Connection, UWF Related Works, UWF Replacement Forestry, Upperchurch Windfarm and UWF Other Activities (Table 2.1).

Purpose: The purpose of the UWF Grid Connection, UWF Related Works, UWF Replacement Forestry and UWF Other Activities Elements is to facilitate the construction and operation of the Upperchurch Windfarm. The Upperchurch Windfarm, when operational, will produce renewable electricity from the wind to supply the National Grid.

Location: The vast majority of the Whole UWF Project is located in County Tipperary with some very minor activities in County Limerick (part of the UWF Other Activities element). The location of each Element of the Whole UWF Project is described hereunder.

Layout: The layout of the Whole UWF Project is also described hereunder.

Table 2-1: Definition of the Individual Project Elements of the Whole UWF Project

Individual Elements of the Whole UWF Project	Overview of each Individual Project Element	Planning Status and Competent Authority
UWF Grid Connection	Mountphilips Substation, Mountphilips – Upperchurch 110kV UGC UWF Grid Connection Access Roads UWF Grid Connection Ancillary Works	Current planning application to An Bord Pleanála
UWF Related Works	Internal Windfarm Cabling, Realigned Windfarm Roads Haul Route Works Telecoms Relay Pole RW Ancillary Works	Current planning application to Tipperary County Council
UWF Replacement Forestry	Replacement Forestry at Foilnaman	Current afforestation license application to the Minister for Agriculture, Food and the Marine
Upperchurch Windfarm	Consented UWF Turbines Consented UWF Substation Consented UWF Roads UWF Ancillary Works	Already consented under Planning Reference: Tipperary Co.Co. 13/51/0003, ABP PL22.243040
UWF Other Activities	Haul Route Activities Upperchurch Hen Harrier Scheme Monitoring Activities Overhead Line Activities	No planning permission required

REFERENCE DOCUMENT

2.1.2 UWF Grid Connection: Purpose, Location and Layout

Overview: The UWF Grid Connection comprises a 110kV substation at Mountphilips, Mountphilips – Upperchurch 110kV UGC, UWF Grid Connection Access Roads and Ancillary Grid Connection Works.
Purpose: The purpose of UWF Grid Connection is to connect the Consented UWF Substation at Upperchurch Windfarm (UWF) to the substation at Mountphilips. Mountphilips substation will be connected to the existing, adjacent Killonan - Nenagh 110kV overhead line and thereby export electricity, from Upperchurch Windfarm when constructed and operational, to the national grid.

Location and Layout

Mountphilips Substation: The new substation is proposed for a locationed adjacent to the existing Killonan - Nenagh 110kV overhead line in agricultural grassland in Mountphilips townland, 2km north of Newport, 4km south of Birdhill, 17km north east of Limerick City and 23km west of the Upperchurch Windfarm. The new 110kV electrical substation will comprise 2 No. End Masts located at the Killonan – Nenagh 110kV overhead line; a compound, 230 meters east of the overhead line, measuring circa. 95 meters x 94 meters which will contain a control building; 110kV busbars; circuit breakers; line disconnects; current and voltage measuring equipment; cable chairs; surge arresters; lightening protection monopoles and other electrical apparatus. The 2 No. End Masts will be connected to the electrical equipment in the compound via underground cable.
Mountphilips - Upperchurch 110kV UGC: The 110kV UGC will connect the Mountphilips Substation to the Upperchurch Windfarm through the Consented UWF Substation, through the installation of underground cables. The route of the underground cables, which is 27.5km in length, will follow a generally west/east course through a mix of agricultural grassland (11.9km), commercial forestry plantations (1.9km), private forestry and farm roads (c.12km) and public roads (c.1.7km) through the townlands of Mountphilips, Coole, Freagh, Oakhampton, Newross, Castlewaller, Killeen, Knockacullin, Bealaclave, Baurnadomeeny, Goulmore, Laghile, Churchquarter, Knocknabansha, Knockmaroe, Knockcurraghbola Crownlands and Knockcurraghbola Commons. The 110kV UGC will be installed underground in trenches, which will be laid with ducts through which the electrical cables and communications cables will be pulled. The cable lengths will be pulled through and joined together at Joint Bay locations, in joint bay chambers. The ducts will be surrounded by concrete and the trench backfilled with excavated material or aggregate depending on the location. The only surface expression of the 110kV UGC will be the man-hole type covers over the Joint Bays and the over-ground identification marker posts and marker plates.
UWF Grid Connection Access Roads: To facilitate access to Mountphilips Substation and the Joint Bay locations and construction works areas along the Mountphilips – Upperchurch 110kV UGC, New Permanent Access Roads will be constructed at Mountphilips and at various locations along the route of the Mountphilips – Upperchurch 110kV UGC. Other access roads include existing farm and forestry roads which will be upgraded during construction works.
UWF Grid Connection Ancillary Works will support the construction of UWF Grid Connection and will include the construction of Temporary Access Roads along the 110kV UGC construction works areas; Permanent Site Entrances (including the provision of sightlines) at Mountphilips, Bealaclave and Knockcurraghbola Commons; Temporary Site Entrances at public road crossings along the 110kV UGC; installation of temporary and permanent watercourse crossing structures; construction and use of 3 No. Temporary Compounds, installation of drainage systems at Mountphilips Substation, around Temporary Compounds and along new UWF Grid Connection Access Roads; forestry felling; temporary and permanent hedgerow/tree removal; permanent hedgerow replanting; fencing; relocation of existing overhead electricity and telephone services and; storage of excavated materials at various locations within the construction works area boundary.

REFERENCE DOCUMENT

2.1.3 UWF Related Works: Purpose, Location and Layout

Overview: The UWF Related Works will consist of Internal Windfarm Cabling, Realigned Windfarm Roads, Haul Route Works, a Telecom Relay Pole and Ancillary UWF Related Works.

Purpose: To connect the Consented Upperchurch Turbines with the Consented Upperchurch Substation, to realign two lengths of Upperchurch Windfarm Roads, and to provide access to a new relay pole which will mitigate impacts from operational Consented UWF Turbines on the communication signals between Foilnaman Mast and Laghtseefin Mast, and to facilitate the haulage of turbine components to the Upperchurch Windfarm site.

Location and Layout

The **Internal Windfarm Cabling** will connect the Consented UWF Turbines to the Consented UWF Substation, through the installation of underground cables in agricultural; forestry lands; and across public roads; in the townlands of Graniera, Shevry, Knockcurraghbola Commons, Knockmaroe, Grousehall, Cummer, Foilnaman, Gleninchnaveigh, Coumnageeha, Coumbeg, Knocknamena Commons, Glenbeg and Seskin. Approximately 62% of the Internal Windfarm Cabling is located under Consented UWF Roads or Realigned Windfarm Roads, the remaining Cabling is located in the vicinity of the windfarm site.

The Internal Windfarm Cabling consists of electrical cables, communication cables and the copper conductor cables which are installed inside High Density Polyethylene (HDPE) ducting in underground trenches. Cable Protection and Warning Tapes will also be laid in the trench. The trench will be excavated, ducting and warning tapes installed and the trench backfilled and reinstated. When the ducting installation is finished and the trench reinstated, the electrical, communication and copper conductor cables will then be pulled through the ducting. The only surface expression of the Internal Windfarm Cabling will be the over-ground identification marker posts and marker plates which will be installed at regular intervals above the cables trench.

The **Realigned Windfarm Roads** are two sections of the already consented windfarm roads which require realignment and one length of new road to link a telecoms mast to the windfarm road. These changes are proposed for windfarm roads in agricultural and forestry lands in the townlands of Shevry, Knockmaroe, and Grousehall, which are all within the Upperchurch Windfarm site.

The **Haul Route Works** are proposed for public road verges, roadside boundaries and grassland fields located adjacent to the L4139-0, L4138-12, L2264-50, L6188-0, L6185-13 and R503 roads in the following townlands: Shevry, Knockcurraghbola Commons, Knocknabansha, Knockmaroe and Grousehall. Works include the removal of soils and laying of crushed stone and hard-core in roadside verges; temporary removal or part-removal of roadside boundaries; opening of temporary entrances and the construction of temporary access roads on private lands.

The **Telecom Relay Pole** is an 18m wooden pole proposed for a location in Knockmaroe townland, close to the existing Foilnaman Mast. Laghtseefin Mast is 9.5km directly south. The Relay Pole will be contained within a small compound, and a low voltage power and communications supply will be provided from the existing Foilnaman Mast. A short length of access road, Realigned Windfarm Road No. RWR3, will provide access to the Telecom Relay Pole from the Consented UWF Road network.

RW Ancillary Works will facilitate the construction of the UWF Related Works and will include temporary access roads; temporary and permanent watercourse crossings; temporary site entrances; change of use from 'agriculture' to 'forestry and agriculture' at the UWF Replacement Forestry entrance at Foilnaman; along with forestry felling; temporary and permanent hedgerow/tree removal; permanent hedgerow replanting; fencing; relocation of existing telephone poles and temporary storage of excavated materials; at various locations within construction works area boundaries.

REFERENCE DOCUMENT

2.1.4 UWF Replacement Forestry: Purpose, Location and Layout

Overview: UWF Replacement Forestry relates to the planting with forestry, of 6ha of agricultural lands. The replacement forestry will comprise native tree and shrub species planted in clusters, with unplanted wide ride lines provided, for the benefit of biodiversity.

Purpose: The UWF Replacement Forestry at Foilnaman will fulfil the replanting obligation which will arise from the felling of forestry for the development of the whole Upperchurch Windfarm project.

Location and Layout

The UWF Replacement Forestry lands are located in two adjoining parcels of agricultural lands in Foilnaman townland, near the village of Upperchurch in County. Tipperary. UWF Replacement Forestry will comprise six hectares (6ha) of agricultural grassland which will be planted with native woodland species, set in clusters of well-matched native species, and will be managed as permanent forest cover.

2.1.5 Upperchurch Windfarm: Purpose, Location and Layout

Overview: Upperchurch Windfarm (UWF) will comprise 22 No. wind turbines, 2 No. meteorological masts, 22 No. turbine foundation and crane hardstanding areas, site roads and an electrical substation. Consented by Tipperary County Council Planning Ref. No. 13/51/0003 in January 2014, and by An Board Pleanála Ref. PL22.243040 in August 2014.

Purpose: The purpose is to convert the energy in the wind blowing on site, into electricity for export to the National Grid.

Location and Layout:
The Upperchurch Windfarm site is located in the townlands of Graniera, Shevry, Knockcurraghbola Commons, Knockmaroe, Grousehall, Cummer, Foilnaman, Gleninchnaveigh, Coumnageeha, Coumbeg, Knocknamena Commons, Glenbeg and Seskin. This is an area 2km west of Upperchurch village and 18km to the west of Thurles, County Tipperary.

The windfarm and ancillary works will be constructed on a series of small hills ranging in elevation from 280m to 401m OD, set out generally over four areas. The electrical substation will be constructed in Knockcurraghbola Commons and the wind turbines will be connected by underground cables to this substation. There will be two meteorological masts erected, one in Grousehall and a second in Knocknamena townlands. Ancillary Works will include borrow pits in Shevry, Knocknamena, Knockmaroe and Grousehall; 1 No. site entrance from the R503 Regional Road at Graniera; and 10 No. site entrances from local public roads, through and around the site, which will provide access to the windfarm.

REFERENCE DOCUMENT

2.1.6 UWF Other Activities: Purpose, Location and Layout

Overview: UWF Other Activities include Haul Route Activities, Upperchurch Hen Harrier Scheme, Monitoring Activities and Overhead Line Activities.

Purpose, Location and Activites:

The **Haul Route Activities** will facilitate the transportation of turbine components to the Upperchurch Windfarm site and are located at various points on the national and regional road network along the UWF turbine component haul route between Foynes Port in County Limerick and junction of the R503 and R497 Regional Roads in Knockmaroe townland, County Limerick. Activities comprise the laying of matting over verges at up to 5 No. locations, removal and replacement of street furniture (mainly signposts) at 13 No. locations and the trimming of up to 960m of hedgerow/trees at up to 15 No. locations.

The **Upperchurch Hen Harrier Scheme** will enhance and protect habitat for hen harrier in the vicinity of Upperchurch Windfarm, in order to fulfil planning condition No.18, attaching to the windfarm. The Upperchurch Hen Harrier Scheme is located in Knockcurraghbola Commons, Coumnageeha, Foilnaman, Knockmaroe and Grousehall townlands on 128ha of agricultural lands between the Slievefelim to Silvermines SPA and the Upperchurch Windfarm. Activities associated with the Scheme includes once off activities such as planting of hedgerows and trees; enhancement of riparian corridors and scrub/wood areas; and the fencing off of watercourses and newly planted trees and shrubs. The Scheme also includes long-term farm management practices such as management of rush coverage, livestock grazing and the control of the use of lime, fertilizers and burning of gorse, amongst others. Nine local landowners are signed-up to the Scheme. Implementation involves a mix of initial once-off activities which will both create new habitat and protect and enhance existing habitat; and on-going farming practices which will result in the long term maintenance of hen harrier habitat.

Monitoring Activities will monitor the Whole UWF Project for compliance with the environmental protection measures and mitigation measures detailed in the UWF 2013 EIS and 2013 RFI (including the Construction Environmental Management Plan for Upperchurch Windfarm and the Ecological Management Plan for Upperchurch Windfarm); Planning Conditions attaching to the already consented UWF; and measures in the 2018 UWF Grid Connection EIA Report, the 2018 UWF Related Works EIA Report and the 2018 UWF Replacement Forestry EIA Report and associated UWF Grid Connection Environmental Management Plan and UWF Related Works Environmental Management Plans. Monitoring will also involve the supervision and recording of key construction activities, and monitoring of progress of land reinstatement.

Overhead Line Activities include re-sagging activities and fibre wrapping activities. The purpose of the re-sagging activities is to correct the tension of the existing overhead line, following the installation of the UWF Grid Connection End Masts, so that the lines are held within predefined tension parameters. The purpose of fibre wrapping is to provide a communication link to the newly installed Mountphilips Substation. The tension will be corrected on 2 no. Sections - i) between ESBN Angle Mast Structure No. 79 (c.200m south of Mountphilips substation) to New Mountphilips End Mast No. 1 and ii) between New Mountphilips End Mast No. 2 and ESBN Angle Mast Structure No. 90 (2.3 km north of Mountphilips substation). Wrapping the overhead line with fibre optic cable from Killonan ESBN substation (just east of Limerick City) to Mountphilips substation. The Overhead Line Activities will be carried out according to industry standard method statements, including standard health & safety and environmental management systems.

REFERENCE DOCUMENT

3 EUROPEAN SITES UNDER CONSIDERATION

3.1 Description of Natura 2000 Sites

The NPWS (2010) guidance identifies that the Appropriate Assessment screening stage of a plan or project should consider the following Natura 2000 sites:

- Any Natura 2000 sites within or adjacent to the plan or project area.
- Any Natura 2000 sites within the likely zone of impact of the plan or project. This is dependent on the nature and scale of the plan, with 15km generally recommended for plans, but potentially much less for projects.
- Any Natura 2000 sites that are more than 15km from the plan or project area, but may potentially be impacted upon, for example, through a hydrological connection.

For the majority of the proposed works, a limited zone of potential impact is predicted, with regard to the relatively small scale, duration and localised nature. A 15km buffer zone has therefore been deemed sufficient and applied for the search criteria and takes into consideration European sites which are located within the wider area, including those with a hydrological connection.

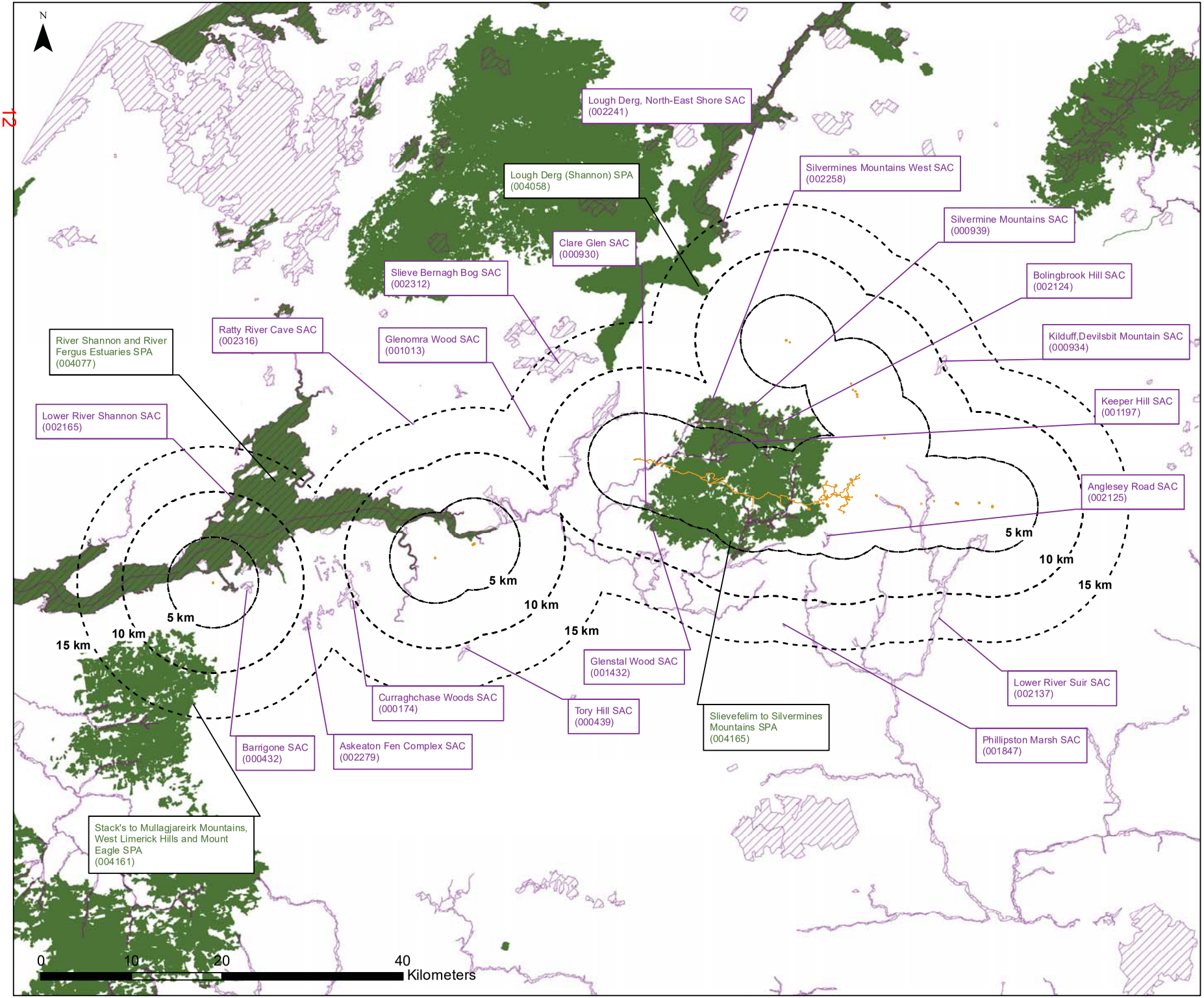
The following 'long list' of 23 European or Natura 2000 Sites have been identified within 15km of the Whole Upperchurch Windfarm Project[2]. The locations of these European Sites are illustrated in Figure 3.1, overleaf.

1. Anglesey Road SAC (Site Code: 002125)
2. Askeaton Fen Complex SAC (Site Code: 002279)
3. Barrigone SAC (Site Code: 000432)
4. Bolingbrook Hill SAC (Site Code: 002124)
5. Clare Glen SAC (Site Code: 000930)
6. Curraghchase Woods SAC (Site Code: 000174)
7. Glenomra Wood SAC (Site Code: 001013)
8. Glenstal Wood SAC (Site code: 001432)
9. Keeper Hill SAC (Site Code: 001197)
10. Kilduff, Devilsbit Mountain SAC (Site Code: 000934)
11. Lough Derg (Shannon) SPA (Site Code: 004058)
12. Lough Derg, North-East Shore SAC (Site Code: 002241)
13. Lower River Shannon SAC (Site Code: 002165)
14. Lower River Suir SAC (Site Code: 002137)
15. Philipston Marsh SAC (Site Code: 001847)
16. Ratty River Cave SAC (Site Code: 002316)
17. River Shannon and River Fergus Estuaries SPA (Site Code: 004077)
18. Silvermine Mountains SAC (Site Code: 000939)
19. Silvermines Mountains West SAC (Site Code: 002258)
20. Slieve Bernagh SAC (Site Code: 002312)
21. Slievefelim to Silvermines SPA (Site Code: 004165)
22. Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (Site Code: 004161)
23. Tory Hill SAC (Site Code: 000439)

[2] Defined as the Construction Works Boundary, project elements 1,2,3,5 and the baseline study boundary for the consented windfarm (project element 4).

REFERENCE DOCUMENT

A description of the European or Natura 2000 sites to undergo consideration is provided overleaf in Table 3.1.



12

Client: Ecopower Developments Ltd.

Project: Whole Windfarm Project

Title:
Figure 3.1 - Natura 2000 Sites within 15 km radius of the Whole Upperchurch Windfarm Project

Legend:
- Whole UWF Project Elements 1 to 5
- 5km,10km,15km Buffer
- Special Area of Conservation
- Special Protection Area

REFERENCE DOCUMENT

For illustrative purposes only. Map not to scale

Disclaimer: Although presented in mapping, please note that the construction works boundary for the Consented Windfarm is included for illustrative purposes only as it is already subject to planning consent. For study area boundaries please see Figure 8.1, and the accompanying EIAR Biodiversity Chapter/Biodiversity Appendix.

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Drawn:	Checked:	Authorised:
POC	CC	HW

Date:	Map Reference:
08/01/2018	EDL - A3 - 02 - 01

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Table 3.1: Natura 2000 Sites within a 15km radius of the whole UWF project.

Natura 2000 Site Name and Code	Qualifying Interest/Special Conservation Interest and Code *denotes a priority habitat	Summary Description (from Site Synopsis)
Anglesey Road SAC (002125)	**Priority Annex I Habitats:** Species-rich *Nardus* Grassland on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* (6230) Sourced from NPWS *Conservation objectives for Anglesey Road SAC [002125]. Generic Version 6.0.*. Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 21/02/2018; Last accessed online on 31/05/2018]	Anglesey Road is a steep-sided valley which extends approximately 1.8 km along the Multeen River to the north of Hollyford village, Co. Tipperary. It contains a range of habitats and species. It is of particular importance for the good quality examples of species rich, unimproved, upland grassland found.
Askeaton Fen Complex SAC (002279)	**Priority Annex I Habitats:** *Cladium* Fens - Calcareous fens with *Cladium mariscus* species of the Caricion davallianae * (7210) **Annex I Habitats:** Alkaline Fens (7230) Sourced from NPWS *Conservation objectives for Askeaton Fen Complex SAC [002279]. Version 1.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 18/05/2018; Last accessed online on 31/05/2018]	Askeaton Fen Complex consists of a number of small fen areas to the east and southeast of Askeaton in Co. Limerick. This area has a number of undulating hills underlain by Lower Carboniferous Limestone. At the base of the hills a series of fens/reedbeds/loughs can be found, often in association with marl or peat deposits. At the south-east of Askeaton, both Cappagh and Ballymorisheen fens are surrounded by large cliff-like rocky limestone outcrops.
Barrigone SAC (000432)	**Priority Annex I Habitats:** Orchid-rich Calcareous Grassland - Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)* (6210) Limestone Pavement* (8240) **Annex I Habitats:** Juniper Scrub- *Juniperus communis* formations on heaths or calcareous grasslands (5130) **Annex II Species:** (1065) Marsh Fritillary (*Euphydryas aurinia*) Sourced from NPWS *Conservation objectives for Barrigone SAC [000432]. Generic Version 6.0.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 21/02/2018; Last accessed online on 31/05/2018]	This SAC is situated approximately 5 km west of Askeaton, Co. Limerick. The site comprises an area of dry, species-rich, calcareous grassland. The underlying limestone outcrops occasionally, and the proximity of the site to the Shannon Estuary adds a maritime influence. A range of scrub types are present including Juniper Scrub. A number of factors, including substrate, bedrock, microclimate and maritime influence, contribute to the floristic richness at Barrigone. The presence of rare species of plant and invertebrate highlight the site's conservation value.
Bolingbrook Hill SAC (002124)	**Priority Annex I Habitats:** Species-rich *Nardus* Grassland on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* (6230)	This upland SAC is approximately 6 km south-east of Silvermines village in Co. Tipperary. It comprises Bolingbrook Hill and the nearby eastern slopes of Silvermine Mountains in Curryquin and Mucklin townlands. Good quality

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Natura 2000 Site Name and Code	Qualifying Interest/Special Conservation Interest and Code *denotes a priority habitat	Summary Description (from Site Synopsis)
	Annex I Habitats: Northern Atlantic Wet Heath with *Erica tetralix* (4010) European Dry Heaths (4030) Sourced from NPWS *Conservation objectives for Bolingbrook Hill SAC [002124]. Generic Version 6.0.*Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 21/02/2018; Last accessed online on 31/05/2018]	examples of species-rich, unimproved upland grassland are present within this site.
Clare Glen SAC (000930)	**Annex I Habitats:** (Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0) **Annex II Species:** (1421) Killarney Fern (*Trichomanes speciosum*) Sourced from NPWS (2016) *Site Synopsis for Clare Glen SAC [000930]. Generic Version 1.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 16/05/2018; Last accessed online on 31/05/2018]	This SAC lies on the Limerick - Tipperary border, in the western foothills of the Slievefelim Mountains, about 10 km north-west of Cappamore. The glen was formed by the action of the Clare River cutting into the Old Red Sandstone. The site comprises the wooded river valley. The woodland, although planted with many exotic trees, is mature and conforms to a type listed on Annex II of the E.U. Habitats Directive. The presence of a number of rare and scarce species including bryophytes and fungi adds further to its importance.
Curraghchase Woods SAC (000174)	**Priority Annex I Habitats:** Alluvial Forests with *Alnus glutinosa and Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* (91E0) Yew Woodlands *Taxus baccata* woods of the British Isles* (91J0) **Annex II Species:** Lesser Horseshoe Bat *Rhinolophus hipposideros* (1303) Sourced from NPWS *Conservation objectives for Curraghchase Woods SAC [000174]. Generic Version 6.0.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 21/02/2018; Last accessed online on 31/05/2018]	This site is situated approximately 7 km east of Askeaton in Co. Limerick. The area is characterised by glacial drift deposits over Carboniferous limestone. The site consists of mixed woodland and a series of wetlands. The site provides hibernation opportunities and foraging habitat for Lesser Horseshoe bat.
Glenomra Wood SAC (001013)	**Annex I Habitats:** Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0) Sourced from NPWS *Conservation objectives for Glenomra Wood SAC [001013]. Generic Version 6.0.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 21/02/2018; Last accessed online on 31/05/2018]	Glenomra Wood is a deciduous semi-natural woodland located in south-east Co. Clare. The dominant tree is Downy Birch (*Betula pubescens*). This is mixed with Sessile Oak (*Quercus petraea*), Ash (*Fraxinus excelsior*) and Beech (*Fagus sylvatica*) throughout.
Glenstal Wood SAC (001432)	**Annex II Species:** Killarney Fern (*Trichomanes speciosum*) (1421) Sourced from NPWS *Conservation objectives for Glenstal Wood SAC [001432]. Version 1.* Department of Arts, Heritage, Regional, Rural and	This SAC lies in the western foothills of the Slievefelim Mountains, about 8 km north-west of Cappamore, Co. Limerick. The glen has been cut into Old Red Sandstone and runs in a north-easterly direction for about 2 km, eventually becoming a steep-sided rocky ravine

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Natura 2000 Site Name and Code	Qualifying Interest/Special Conservation Interest and Code *denotes a priority habitat	Summary Description (from Site Synopsis)
	Gaeltacht Affairs. [Version dated 15/05/2018; Last accessed online on 31/05/2018]	
Keeper Hill SAC (001197)	**Priority Annex I Habitats:** Blanket Bogs (* if active bog) (7130) **Annex I Habitats:** Northern Atlantic Wet Heath with *Erica tetralix* (4010) Sourced from NPWS *Conservation Objectives: Keeper Hill SAC 001197. Version 1.* National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht. [Version dated 17/10/2017; Last accessed online on 31/05/2018]	This SAC is situated between the Silvermines and Slieve Felim Mountains, 13 km south of Nenagh in Co. Tipperaray. Consisting of a steep peak of Old Red Sandstone is notably higher than any of the surrounding upland areas. The site includes the summit and slopes above 250 m which have not yet been afforested. Peregrine Falcon, an Annex I species breeds within the site. Red Grouse occur amongst the tall heather east of the summit.
Kilduff, Devilsbit Mountain SAC (000934)	**Priority Annex I Habitats:** Species-rich *Nardus* Grassland on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* (6230) **Annex I Habitats:** European Dry Heaths (4030) Sourced from NPWS *Conservation objectives for Kilduff, Devilsbit Mountain SAC [000934]. Generic Version 6.0.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 21/02/2018; Last accessed online on 31/05/2018]	This upland site is situated approximately 6 km north-west of Templemore in Co. Tipperary. It comprises the summit of Devilsbit Mountain and much of the eastern side of the ridge which extends northwards to Kilduff Mountain. The rare and protected Small-white Orchid is also present on site and adds significantly to the value of the site.
Lough Derg (Shannon) SPA (004058)	Cormorant (*Phalacrocorax carbo*) (A017) Tufted Duck (*Aythya fuligula*) (A061) Goldeneye (*Bucephala clangula*) (A067) Common Tern (*Sterna hirundo*) (A193) Wetland and Waterbirds Sourced from NPWS *Conservation objectives for Lough Derg (Shannon) SPA [004058]. Generic Version 6.0.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 21/02/2018; Last accessed online on 31/05/2018]	Lough Derg lies within counties Tipperary, Galway and Clare and is the largest of the River Shannon Lakes. The greater part of the lake lies on Carboniferous limestone while the narrow southern section is underlain by Silurian strata. The site is of high ornithological importance as it supports nationally important breeding populations of Cormorant and Common Tern. In winter, it has nationally important populations of Tufted Duck and Goldeneye. The annex I species Whooper Swan, Greenland White-fronted Goose, Hen Harrier and Common Tern have also been recorded on site.
Lough Derg, North-East Shore SAC (002241)	**Priority Annex I Habitats:** Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae* (7210) Limestone Pavement* (8240) Alluvial Forests with *Alnus glutinosa and Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* (91E0) Yew Woodlands *Taxus baccata* woods of the British Isles* (91J0)	Lough Derg, the lowest order lake on the River Shannon, is one of the largest bodies of freshwater in Ireland. The site includes the northern shore of the lake from the mouth of the Cappagh River in the north-west to just below Black Lough at the north-eastern shore. The greater part of this site lies on Carboniferous limestone.

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Natura 2000 Site Name and Code	Qualifying Interest/Special Conservation Interest and Code *denotes a priority habitat	Summary Description (from Site Synopsis)
	Annex I Habitats: Alkaline Fens (7230) Juniper Scrub - *Juniperus communis* formations on heaths or calcareous grasslands (5130) Sourced from NPWS (2016) *Conservation objectives for Lough Derg, North-east Shore SAC [002241]. Generic Version 6..0.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [[Version dated 21/02/2018; Last accessed online on 31/05/2018]	
Lower River Shannon SAC (002165)	**Priority Annex I Habitats:** Alluvial Forests with *Alnus glutinosa and Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* (91E0) Coastal Lagoons* (1150) **Annex I Habitats:** Sandbanks which are slightly covered by sea water all the time (1110) Estuaries (1130) Mudflats and sand flats not covered by seawater at low tide (1140) Large shallow inlets and bays (1160) Reefs (1170) Perennial Vegetation of stony banks (1220) Vegetated sea cliffs of the Atlantic and Baltic coasts (1230) *Salicornia* and other annuals colonizing mud and sand (1310) Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330) Mediterranean salt meadows (*Juncetalia maritimi*) (1410) Floating river vegetation - Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*) (6410) **Annex II species:** Freshwater Pearl-Mussel (*Margaritifera margaritifera*)(1029) Atlantic Salmon (*Salmo salar*) ((only in fresh water) (1106) Sea Lamprey (*Petromyzon marinus*) (1095) Brook Lamprey (*Lampetra planeri*) (1096) River Lamprey (*Lampetra fluviatilis*) (1099) Bottlenose Dolphin (*Tursiops truncates*) (1349) Otter (*Lutra lutra*) (1355)	This very large site stretches along the Shannon valley from Killaloe in Co. Clare to Loop Head/ Kerry Head. The site 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. 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 Killeenagarriff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia. This site contains the only known resident population of Bottle-nosed Dolphin in Ireland and all three Irish lamprey species. This site supports more wintering wildfowl and waders than any other site in the country and supports a large number of migratory birds.

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Natura 2000 Site Name and Code	Qualifying Interest/Special Conservation Interest and Code *denotes a priority habitat	Summary Description (from Site Synopsis)
	Sourced from NPWS *Conservation Objectives: Lower River Shannon SAC 002165. Version 1.0.* National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. [Version dated 07/08/2012; Last accessed online on 31/05/2018]	
Lower River Suir SAC (002137)	**Priority Annex I Habitats:** Alluvial Forests with *Alnus glutinosa and Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* (91E0) Yew Woodlands *Taxus baccata* woods of the British Isles* (91J0) **Annex I Habitats:** Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) (1330) Mediterranean salt meadows (*Juncetalia maritimi*) (1410) Floating river vegetation - Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260) Hydrophilous tall herb fringe communities of plains and of the montane (6430) Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0) **Annex II species:** 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) Twaite Shad (*Alosa fallax fallax*) (1103) Salmon (*Salmo salar*) (1106) Otter (*Lutra lutra*) (1355) Sourced from NPWS *Conservation Objectives: Lower River Suir SAC 002137. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 28/03/2017; Last accessed online on 31/05/2018]	This SAC consists of the freshwater stretches of the River Suir immediately south of Thurles, the tidal stretches as far as the confluence with the Barrow/Nore immediately east of Cheekpoint in Co. Waterford, and many tributaries including the Clodiagh in Co. Waterford, the Lingaun, Anner, Nier, Tar, Aherlow, Multeen and Clodiagh in Co. Tipperary. The Suir and its tributaries flow through the counties of Tipperary, Kilkenny and Waterford. The presence of two legally protected plants (Flora (Protection) Order, 1999) and the ornithological importance of the site adds to the ecological interest and importance of the site.
Philipston Marsh SAC (001847)	**Annex I Habitats:** Transition mires and quaking bogs (7140) Sourced from NPWS *Conservation objectives for Philipston Marsh SAC [001847]. Version 1.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 12/01/2018; Last accessed online on 31/05/2018]	This site is a small wetland and represents one of only two examples of calcareous fen and mire vegetation in the Mulkear River catchment.

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Natura 2000 Site Name and Code	Qualifying Interest/Special Conservation Interest and Code *denotes a priority habitat	Summary Description (from Site Synopsis)
Ratty River Cave SAC (002316)	**Annex I Habitats:** Caves not open to the public (8310) **Annex II Species:** Lesser Horseshoe Bat (*Rhinolophus hipposideros*) (1303) Sourced from NPWS (2016) *Conservation objectives for Ratty River Cave SAC [002316]. Generic Version 6.0.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 21/02/2018; Last accessed online on 31/05/2018].	This site includes a cave that is an annex I habitat and provides winter hibernation conditions for an internationally important number of Lesser Horseshoe Bat. There is also a summer roost for Lesser Horseshoe bats within this site.
River Shannon and River Fergus Estuaries SPA (004077)	Cormorant (*Phalacrocorax carbo*) (A017) Whooper Swan (*Cygnus cygnus*) (A038) Light-bellied Brent Goose (*Branta bernicla hrota*) (A046) Shelduck (*Tadorna tadorna*) (A048) Wigeon (*Anas penelope*) (A050) Teal (*Anas crecca*) (A052) Pintail (*Anas acuta*) (A054) Shoveler (*Anas clypeata*) (A056) Scaup (*Aythya marila*) (A062) Ringed Plover (*Charadrius hiaticula*) (A137) Golden Plover (*Pluvialis apricaria*) (A140) Grey Plover (*Pluvialis squatarola*) (A141) Lapwing (*Vanellus vanellus*) (A142) Knot (*Calidris canutus*) (A143) Dunlin (*Calidris alpina*) (A149) Black-tailed Godwit (*Limosa limosa*) (A156) Bar-tailed Godwit (*Limosa lapponica*) (A157) Curlew (*Numenius arquata*) (A160) Redshank (*Tringa totanus*) (A162) Greenshank (*Tringa nebularia*) (A164) Black-headed Gull (*Chroicocephalus ridibundus*) (A179) Wetland and Waterbirds (A999) Sourced from NPWS *Conservation Objectives: River Shannon and River Fergus Estuaries SPA 004077. Version 1.0.* National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. [Version dated 17/09/2012; Last accessed online on 31/05/2018]	The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The site comprises the entire estuarine habitat from Limerick City westwards as far as Doonaha in Co. Clare and Dooneen Point in Co. Kerry. This site is an internationally important site that supports an assemblage of over 20,000 wintering waterbirds. It holds internationally important populations of four species; Light-bellied Brent Goose, Dunlin, Black-tailed Godwit and Redshank. Furthermore 17 species have wintering populations of national importance. The site holds a nationally important breeding population of Cormorant. Three annex I species are listed regularly; Whooper Swan, Golden Plover and Bar-tailed Godwit. Parts of the River Shannon and River Fergus Estuaries SPA are Wildfowl Sanctuaries.

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Natura 2000 Site Name and Code	Qualifying Interest/Special Conservation Interest and Code *denotes a priority habitat	Summary Description (from Site Synopsis)
Silvermine Mountains SAC (000939)	**Priority Annex I Habitats:** Species-rich *Nardus* Grassland on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)* (6230) **Annex I Habitats:** Northern Atlantic Wet Heath with *Erica tetralix* (4010) Sourced from NPWS *Conservation objectives for Silvermine Mountains SAC [000939]. Generic Version 6.0.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 21/02/2018; Last Accessed online on 31/05/2018]	This small site is situated on the northern slopes of the Silvermine Mountains, 1 km south-east of Silvermines village in Co. Tipperary. The geology of the area is sandstone of different ages - older Silurian on the central part of the mountain, while the outer parts are composed of yellowish and red sandstones of Devonian age. The rare Small-white Orchid is also present on site and adds significantly to the value of the site.
Silvermines Mountains West SAC (002258)	**Annex I Habitats:** Northern Atlantic Wet Heath with *Erica tetralix* (4010) European Dry Heath (4030) Calaminarian grasslands of the Violetalia calaminariae (6130) Sourced from NPWS *Conservation objectives for Silvermines Mountains West SAC [002258]. Version 1* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 10/11/2017; Last accessed online on 31/05/2018]	This SAC is situated to the north of Keeper Hill, about 10 km south of Nenagh in Co. Tipperary. A ridge composed of Old Red Sandstone is visibly very prominent in the landscape when viewed from the Nenagh to Limerick road. The site is of conservation importance for its heath and grassland vegetation, and as a foraging area for Hen Harrier, and is one of the only extensive unplanted uplands remaining in north Tipperary.
Slieve Bernagh Bog SAC (002312)	**Priority Annex I Habitats:** Blanket Bogs (* if active bog) (7130) **Annex I Habitats:** Northern Atlantic Wet Heath with *Erica tetralix* (4010) European Dry Heath (4030) Sourced from NPWS *Conservation Objectives: Slieve Bernagh Bog SAC 002312. Version 1.* National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 18/08/2016; Last accessed online on 31/05/2018]	The Slieve Bernagh Bog is situated to the west of Lough Derg, Co. Clare. The site comprises the Slieve Bernagh mountain range, with the highest peaks at Moylussa (532 m) and Cragnamurragh (526 m), and the surrounding peatlands that flank its northern slopes.
Slievefelim to Silvermines SPA (004165)	Hen Harrier (*Circus cyaneus*) (A082) Sourced from NPWS *Conservation objectives for Slievefelim to Silvermines Mountains SPA [004165]. Generic Version 6.0.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 21/02/2018; Last accessed online on 31/05/2018]	This SPA is an upland site located in Counties Tipperary and Limerick. It includes the peaks Keeper Hill, Slieve Felim, Knockstanna, Knockappul, Mother Mountain, Knockteige, Cooneen Hill and Silvermine Mountain. The site is underlain mainly by sandstones of Silurian age. Several important rivers rise within the site, including the Mulkear, Bilboa and Clare. The Slievefelim to Silvermines SPA is of ornithological importance because it provides nesting and foraging habitat for breeding Hen Harrier. The annex I species Merlin and Peregrine have also been recorded on site.

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Natura 2000 Site Name and Code	Qualifying Interest/Special Conservation Interest and Code *denotes a priority habitat	Summary Description (from Site Synopsis)
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)	Hen Harrier (*Circus cyaneus*) (A082) Sourced from NPWS *Conservation objectives for Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA [004161]. Generic Version 6.0.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 21/02/2018; Last accessed online on 31/05/2018]	This is a very large site centred on the borders between the counties of Cork, Kerry and Limerick. The mountains; Knockfeha, Mount Eagle, Knockanefune, Garraunbaun, Taur, Rock Hill, Knockacummer, Mullaghamuish, Knight's Mt, Ballincollig Hill, Beennageeha Mt, Sugar Hill, Knockanimpuba and Knockathea, amongst others are included in this site. Many rivers rise within the site, notably the Blackwater, Owentaraglin, Owenkeal, Glenlara, Feale, Clydagh, Allaghaun, Allow, Oolagh, Galey and Smerlagh. The site is of ornithological importance because it provides nesting and foraging habitat for breeding Hen Harrier. The annex I species Merlin and Short-eared Owl have also been recorded on site.
Tory Hill SAC (000439)	**Priority Annex I Habitats:** Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites) (6210) *Cladium* Fens - Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae* (7210) **Annex I Habitats:** Alkaline Fens (7230) Sourced from NPWS *Conservation objectives for Tory Hill SAC [000439]. Generic Version 6.0.* Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Version dated 21/02/2018; Accessed online on 31/05/2018]	Tory Hill is an isolated, wooded limestone hill situated about 2 km north-east of Croom, Co. Limerick. It is a prime example of a limestone hill set amongst a region of volcanic intrusions. The hill is of geomorphological interest for the end-moraine and for icemarks visible on the solid rock. The site includes Lough Nagirra and its associated wetland vegetation, located to the north and north-east of Tory Hill.

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4 STAGE 1 SCREENING REPORT

4.1 Brief Description of the Project

A brief description of the individual elements/proposals pertaining to the Whole UWF Project is provided in Section 2. For the avoidance of doubt, **EIAR Main Report Chapter 5** of each respective application fully describes the respective project elements and is provided as **Appendix A4-A8 to this NIS**.

4.2 EU Sites under Consideration

The following 'long list' of 23 European (EU) or Natura 2000 Sites have been identified for consideration within an initial screening buffer of 15km of all elements of the Whole UWF Project:

In the interest of succinctness, and to facilitate a complete examination and analysis of the likely significant effects on EU sites, Screening reporting on the 23 European Sites comprising the 'long list' has been informed via a source-pathway-effect conceptual model, wherein each specific Qualifying Interest (in the case of SAC's) or Special Conservation Interest (in the case of SPA's) of every EU site under consideration is evaluated against identified source-pathway linkages for possible significant effects arising from the Whole Upperchurch Windfarm Project (Whole UWF Project), including its respective project Elements.

1. Anglesey Road SAC (Site Code: 002125)
2. Askeaton Fen Complex SAC (Site Code: 002279)
3. Barrigone SAC (Site Code: 000432)
4. Bolingbrook Hill SAC (Site Code: 002124)
5. Clare Glen SAC (Site Code: 000930)
6. Curraghchase Woods SAC (Site Code: 000174)
7. Glenomra Wood SAC (Site Code: 001013)
8. Glenstal Wood SAC (Site code: 001432)
9. Keeper Hill SAC (Site Code: 001197)
10. Kilduff, Devilsbit Mountain SAC (Site Code: 000934)
11. Lough Derg (Shannon) SPA (Site Code: 004058)
12. Lough Derg, North-East Shore SAC (Site Code: 002241)
13. Lower River Shannon SAC (Site Code: 002165)
14. Lower River Suir SAC (Site Code: 002137)
15. Philipston Marsh SAC (Site Code: 001847)
16. Ratty River Cave SAC (Site Code: 002316)
17. River Shannon and River Fergus Estuaries SPA (Site Code: 004077)
18. Silvermine Mountain SAC (Site Code: 000939)
19. Silvermine Mountain West SAC (Site Code: 002258)
20. Slieve Bernagh SAC (Site Code: 002312)
21. Slievefelim to Silvermines SPA (Site Code: 004165)
22. Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (Site Code: 004161)
23. Tory Hill SAC (Site Code: 000439)

REFERENCE DOCUMENT

4.2.1 Approach for Consideration of Project Effects on European Sites:

The Screening to inform the Appropriate Assessment process examines possible effects on European Sites from sources applicable to the Whole Upperchurch Windfarm Project (Whole UWF Project). In each table individual project Elements are considered with regard to the European Site under consideration, to allow full consideration in turn by the relevant competent authorities of the effects (alone or in combination) of those respective elements of the Whole UWF Project.

Impact sources applicable to the consented Upperchurch Windfarm, which has already been subject to Appropriate Assessment by a competent authority, are herein (re)considered in combination with those other project Elements under consideration, both for completeness and to fully appraise likely in combination effects. For clarity this reporting also considers and evaluates the likely significant effects (if any) of the Upperchurch Windfarm Hen Harrier Scheme.

We note that the presentation of identified *possible* exposure pathways in respect of European Sites within tables does not infer that these pathways or *significant adverse effects* exist; rather they are being presented to demonstrate consideration within the conceptual Screening model. Effects considered and evaluated include direct, indirect or secondary, alone or in combination.

In relation to environmental protection measures which are part of the project design, we additionally note that the UWF Grid Connection EIA Report, UWF Related Works EIA Report, and UWF Replacement Forestry EIA Report (Volume C of each respective application) have made reference to the incorporation of Best Practice or 'Tried and tested' methods or measures into the Project Design (Project Design Measures), for the avoidance of significant impacts on Biodiversity receptors, within the remit and context of reporting for the EIA Directive. Further Best Practice Measures, pertinent management plans (invasive species, waste and surface water quality), in addition to Emergency Response Procedures will also be implemented during construction, operation and decommissioning works and activities.

All measures are presented in the respective Chapter 8(s): Biodiversity of the accompanying UWF Grid Connection EIA Report, UWF Related Works EIA Report, and UWF Replacement Forestry EIA Report. All Project Design Measures, Best Practice Measures, pertinent Management Plans and Emergency Response Procedures are included in full in the accompanying UWF Grid Connection Environmental Management Plan and UWF Related Works Environmental Management Plan (both of whichare included within Appendix A9 and A10 of this document and referenced herein accordingly) and in the Construction Environmental Management Plan for Upperchurch Windfarm and the 2013 RFI for Upperchurch Windfarm, the implementation of which is a condition of planning permission (see Appendices A7 and A16). The Best Practice Measures which will be implemented for UWF Other Activities are described in the Description of UWF Other Activities (A8). The implementation of these measures will be a contractual obligation upon the appointed contractor(s).

The appended Chapter 5(s) and compiled Description of the Consented Upperchurch Windfarm and the Description of UWF Other Activities (see Appendix A4-A8) provides the Project Element descriptions required to inform this reporting and subsequent Appropriate Assessment.

The current Screening reporting evaluates the potential for significant effects on European Sites arising from the proposed Project Element, in the absence of any measures[3] which have been prescribed for the avoidance or reduction of harmful effects on designated European Sites.

[3] This includes Project Design (PD) measures, Best Practice Measures (BPM'S), Emergency Response Measures or Procedures and any Management Plans such as for Waste, Surface Water Quality, Invasive Species.

REFERENCE DOCUMENT

4.2.2 Distance from European Sites to Project Elements of the Whole UWF Project

The following tables provide the respective distances[4] from each Element of the Whole UWF Project to European Sites within 15km (the initial screening buffer) in order of UWF Grid Connection; UWF Related Works, UWF Replacement Forestry, the consented Upperchurch Windfarm (extracted from the previous NIS[5]) and UWF Other Activities.

Table 4.1: Summary of European Sites within the **UWF Grid Connection** Study Area

European Site	Distance from UWF Grid Connection
Anglesey Road SAC (002125)	3.3 km south of the UWF Grid Connection cable route
Bolingbrook Hill SAC (002124)	6.3 km north of the UWF Grid Connection cable route.
Clare Glen SAC (000930)	4.5 km south of the UWF Grid Connection cable route.
Glenomra Wood SAC (001013)	11.2 km west of the UWF Grid Connection cable route.
Glenstal Wood SAC (001432)	5.8 km south of the UWF Grid Connection cable route.
Keeper Hill SAC (001197)	2.0 km north of the UWF Grid Connection
Lough Derg (Shannon) SPA (004058)	10.4 km north of the UWF Grid Connection
Lower River Shannon SAC (002165)	0 km – The UWF Grid Connection cable route passes through the boundary of the Lower River Shannon SAC at three locations; 70m along a farm track on the northern side of the Mulkear river at Oakhampton and under the Mulkear River at Oakhampton/Newross, Co. Tipperary and under the Bilboa River at Laghile/Churchquarter, Co. Tipperary.
Lower River Suir SAC (002137)	4.4 km east of the UWF Grid Connection cable route.
Philipston Marsh SAC (001847)	13.1 km south of the UWF Grid Connection
Silvermine Mountain SAC (000939)	7.2 km north of the UWF Grid Connection
Silvermine Mountain West SAC (002258)	5.7 km north of the UWF Grid Connection
Slieve Bernagh Bog SAC (002312)	11.5 km west of the UWF Grid Connection cable route.
Slievefelim to Silvermines SPA (004165)	The UWF Grid Connection cable route is within the boundaries of the Slievefelim to Silvermines SPA.

Table 4.2: Summary of European Sites within the **UWF Related Works** Study Area

European Site	Distance from UWF Related Works
Anglesey Road SAC (002125)	2.9 km south of the UWF Related Works
Bolingbrook Hill SAC (002124)	7.2 km north west of the UWF Related Works
Keeper Hill SAC (001197)	10.9 km northwest of the UWF Related Works
Kilduff, Devilsbit Mountain SAC (000934)	13.7 km northeast of the UWF Related Works
Lower River Shannon SAC (002165)	1.5km west of the UWF Related Works
Lower River Suir SAC (002137)	3km east of the UWF Related Works
Philipston Marsh SAC (001847)	13.0 km south of the UWF Related Works
Silvermine Mountain SAC (000939)	11.5km northwest of the UWF Related Works
Silvermine Mountain West SAC (002258)	12.5 km north of the UWF Related Works
Slievefelim to Silvermines SPA (004165)	The UWF Related Works is within the boundaries of the Slievefelim to Silvermines SPA.

[4] Distances are rounded down to one decimal place

[5] 2013 RFI for Upperchurch Windfarm, included in A16

***Table 4.3**: Summary of European Sites within the **UWF Replacement Forestry** Study Area*

European Site	Distance from UWF Replacement Forestry
Anglesey Road SAC (002125)	5 km south of the UWF Replacement Forestry
Bolingbrook Hill SAC (002124)	8.1 km of the UWF Replacement Forestry
Keeper Hill SAC (001197)	12.1km northwest of the UWF Replacement Forestry
Kilduff, Devilsbit Mountain SAC (000934)	16.1 km northeast of the UWF Replacement Forestry
Lower River Shannon SAC (002165)	4.1km west of the UWF Replacement Forestry
Lower River Suir SAC (002137)	4.9km east of the UWF Replacement Forestry
Silvermine Mountain SAC (000939)	12.5km northwest of the UWF Replacement Forestry
Silvermine Mountain West SAC (002258)	13.6km north west of the UWF Replacement Forestry
Slievefelim to Silvermines SPA (004165)	1.4km west of the UWF Replacement Forestry

Table 4.4: Summary of European Sites within the consented **Upperchurch Windfarm** Study Area

European Site	Distance from Upperchurch Windfarm
Anglesey Road SAC (002125)	2.5 km south west
Bolingbrook Hill SAC (002124)	6.9 km north west
Keeper Hill SAC (001197)	10.7 km north west
Kilduff, Devilsbit Mountain SAC (000934)	13.3 km north east
Lower River Shannon SAC (002165)	2.7 km west
Lower River Suir SAC (002137)	2.8 km east and c.4.1km downstream
Philipston Marsh SAC (001847)	13.6 km south west
Silvermine Mountain SAC (000939)	11.0 km north west
Silvermine Mountain West SAC (002258)	11.2 km north west
Slievefelim to Silvermines SPA (004165)	Adjacent to the western boundary of turbines T17 to T21.

Table 4.5: Summary of European Sites within the **UWF Other Activities** Study Area[6]

European Site	Distance from Other Activities
Anglesey Road SAC (002125)	2.5km south of UWF Other Activities
Askeaton Fen Complex SAC (002279)	7.3km west of UWF Other Activities
Barrigone SAC (000432)	3km east of UWF Other Activities
Bolingbrook Hill SAC (002124)	6.3km north of UWF Other Activities
Clare Glen SAC (000930)	4.5km south of UWF Other Activities
Curraghchase Woods SAC (000174)	9.3km west of UWF Other Activities
Glenomra Wood SAC (001013)	9.1km northwest of UWF Other Activities
Glenstal Wood SAC (001432)	5.8km south of UWF Other Activities
Keeper Hill SAC (001197)	2km north of UWF Other Activities
Kilduff, Devilsbit Mountain SAC (000934)	8.7km northeast of UWF Other Activities
Lough Derg (Shannon) SPA (004058)	8.1 km northwest of UWF Other Activities
Lough Derg, North-East Shore SAC (002241)	12.9km northwest of UWF Other Activities
Lower River Shannon SAC (002165)	0km of UWF Other Activities
Lower River Suir SAC (002137)	0m: The HA19 location on the R503 overlaps the Site boundary
Philipston Marsh SAC (001847)	13.9km southwest of UWF Other Activities
Ratty River Cave SAC (002316)	14.8km of UWF Other Activities
River Shannon and River Fergus Estuaries SPA (004077)	354m northwest of UWF Other Activities
Silvermine Mountain SAC (000939)	8.5km southwest of UWF Other Activities

[6] Note: Distances are presented in respect of the nearest point of the Construction Works Boundary/Site Boundary of respective elements where activities will be taking place.

REFERENCE DOCUMENT

European Site	Distance from Other Activities
Silvermine Mountain West SAC (002258)	9.5 km southwest of UWF Other Activities
Slieve Bernagh Bog SAC (002312)	9.6km northwest of UWF Other Activities
Slievefelim to Silvermines SPA (004165)	0m southwest of UWF Other Activities
Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)	5.9km south of UWF Other Activities
Tory Hill SAC (000439)	10.3km southeast of UWF Other Activities

REFERENCE DOCUMENT

4.2.3 Evaluation of Potential Impact Pathways

Potential impact pathways comprise connectivity between the proposed project Elements (the Whole Project) and the identified European Sites listed above, with regard to the qualifying interests (QIs) and the special conservation interests (SCIs) for SAC and SPA sites respectively. These European Sites within the zone of influence are examined on the basis of proximity to project Elements and potential pathways over land or via hydrological / hydrogeological connectivity, with regard to the potential impact sources associated with project construction and operation stages. Further explanation of the Conceptual Screening Model (Tables 4.6 – Table 4.28) is outlined as follows:

1. Qualifying Interests: These are the set of qualifying habitats and species for which the SAC is designated;
2. Special Conservation Interests: These are the set of bird species and supporting habitat for which the SAC is designated;
3. Potential sources of impacts affecting European Sites (alone or in-combination with other project Elements, plans or projects): These comprise a comprehensive identification of all impacts arising from the project works or activities associated with all elements of the construction and operation phase;
4. Possible Exposure Pathways to QI/SCI: The connectivity between the impact source from the project Elements and any European Sites, with regard to the specific sensitivities or dependencies of the qualifying interest / special conservation interest;
5. Potential Effect(s) on QI/SCI: This outlines the potential for an outcome arising from an impact source being transmitted via an exposure pathway and interacting with the qualifying interest / special conservation interest;
6. Examination and Analysis of Identified Source -Possible Pathway-Receptor links: Explanatory text outlining what significant effects are appraised as likely taking account of the source / pathway connectivity to the QI/SCI receptors. Where potential for significant effects cannot be excluded, these effects are identified and will require further examination; confirmation is provided herein as to whether other potential source impact pathways, have been evaluated as likely or not (in instances wehere multiple pathways exist, but not all are considered likely);
7. Screened Out at Stage 1 with Justification or Screened In with Justification / Precautionary Principle: Summary evaluation of whether the QI/SCI can be screened out on the basis that the potential for significant adverse effects are not likely; or conversely, in the event that significant adverse effects cannot be excluded, the QI must be screened in for further examination with regard to the specific potential effects identified.

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Table 4.6 Stage 1 Conceptual model for Anglesey Road SAC (002125)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source - Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Species-rich *Nardus* Grassland* (6230)	Construction	Movement of soils and machinery/ Earthworks and Excavations/ Runoff/Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/ Use of cement based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage	Excavations/Runoff and SW Flows/ SW Flowpaths/ GW Flowpaths/ Nitrogen Deposition	Habitat Degradation	1: UWF Grid Connection	1: UWF Grid Connection: 3.3km	No potential for Significant effects due to distance and the absence of pathways, e.g. hydrological connection.	1.UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 2.9km	No potential for Significant effects due to distance and the absence of pathways, e.g. hydrological connection.	2.UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 5km	No potential for Significant effects due to distance and the absence of pathways, e.g. hydrological connection.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.5km	No potential for Significant effects due to distance and the absence of pathways, e.g. hydrological connection.	4. Consented Upperchurch WF **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 2.5km	No potential for Significant effects due to distance and the absence of pathways, e.g. hydrological connection.	5. UWF Other Activities **Screened Out**
Conclusion: There are no direct effects on the European Site under consideration. No source pathway linkage for secondary Habitat Degradation (either alone or in combination) effects exists. Agricultural improvement and afforestation are the main threats. It can reasonably be concluded no likely significant effect on this Qualifying Interest habitat/European Site will occur.								

* Priority Annex I habitat †Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

REFERENCE DOCUMENT

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Table 4.7 Stage 1 Conceptual model for Askeaton Fen Complex SAC (002279)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source - Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Cladium Fens* (7210) Alkaline Fens (7230)	Construction	Movement of soils and machinery/ Earthworks and Excavations/ Runoff/Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/ Use of cement based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage	Excavations/ Runoff and SW Flows/ SW Flowpaths/ GW Flowpaths/ Nitrogen Deposition Soils	Habitat degradation via Groundwater level effects/ Suspended Solid Input/ Morphological Effects/ Groundwater and Surface Water Contamination/ Nutrient Input/ Habitat Degradation from the spread of Invasive Species	1: UWF Grid Connection	1: UWF Grid Connection: 31.4km	No potential for Significant effects due to distance	1.UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 48.2km	No potential for Significant effects due to distance	2.UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 52km	No potential for Significant effects due to distance	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 50.3km	No potential for Significant effects due to distance	4. Consented Upperchurch WF **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 7.3km	No potential for Significant effects due to distance and the minimal nature of works in closest proximity. Traffic will not pass in close proximity.	5. UWF Other Activities **Screened Out**
Conclusion: There are no direct effects on this European Site. No source pathway linkage for secondary Habitat Degradation (either alone or in combination) effects exists. In respect of invasive species, traffic will not pass in close proximity or along adjacent roads. The main threats to the European site are increased drainage, fire suppression, Land reclamation, fertilisation and human habitation. The nature of works in closest proximity as part of Other Activities (street furniture removal and reinstatement as part of 5) preclude the likelihood of significant effects; therefore, in the absence of any probable source-pathway links it can reasonably be concluded no likely significant effect on this Qualifying Interest habitat /European Site will occur.								

* Priority Annex I habitat †Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

REFERENCE DOCUMENT

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Table 4.8 Stage 1 Conceptual model for Barrigone SAC (000432)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source - Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Orchid-rich Calcareous Grassland* (6210) Limestone Pavement* (8240) Juniper Scrub (5130) Marsh Fritillary (*Euphydryas aurinia*) (MF)	Construction	Movement of soils and machinery/ Earthworks and Excavations/ Runoff/Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/ Use of cement based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage	Excavations/ Runoff and SW Flows/ SW Flowpaths/ GW Flowpaths/ Nitrogen Deposition	Habitat degradation via Groundwater level effects/ Suspended Solid Input/ Morphological Effects/ Groundwater and Surface Water Contamination/ Nutrient Input/ Habitat Degradation	1: UWF Grid Connection	1: UWF Grid Connection: 44.1km	No potential for Significant effects due to distance and the absence of pathways, e.g. hydrological connection.	1.UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 48.2km	No potential for Significant effects due to distance and the absence of pathways, e.g. hydrological connection.	2.UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 64.9km	No potential for Significant effects due to distance and the absence of pathways, e.g. hydrological connection.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 53km	No potential for Significant effects due to distance and the absence of pathways, e.g. hydrological connection.	4. Consented Upperchurch WF **Screened Out**
		Movement of Soils and Machinery/Ground and air vibrations	Soils/Air/ Contact	Spread of Invasive species/Disturbance to MF/Mortality of Adult MF	5: UWF Other Activities	5: UWF Other Activities: 3km	In relation to Marsh Fritillary, the haul route as part of 5 is along the N69 adjacent to the SAC and as such the potential for the importation of invasive species to the SAC has been considered. No invasive species were recorded overlapping haul route activity locations including HA1 therefore potential for transfer is absent. No potential for disturbance or mortality effects on Marsh Fritillary due to the momentary-brief duration of any passing traffic. Any potential effect will be buffered by the roadside verge. The next known closest population of Marsh Fritillary recorded in baseline studies is approximately 54km to the east of this	5. UWF Other Activities **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source - Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
							SAC. As such, there is no potential for significant in combination effects due to the absence of meta-population connectivity.	
Conclusion: There are no direct effects on this European Site. No source pathway link for secondary Habitat Degradation effects exists at nearest point of the closest project element i.e. UWF Other Activities. The remaining Project Elements are separated by a distance of >44km. The absence of a hydrological connection also precludes significant effects. Secondary and Cross-factor effects in respect of disturbance to Marsh Fritillary, mortality of adult Marsh Fritillary and the introduction of invasive species to Marsh Fritillary habitat have been considered; however, there is no potential for significant effects. It can reasonably be concluded no likely significant effect will occur overall. As such, there is no potential for significant effects on Qualifying Interests /this European Site.								

* Priority Annex I habitat †Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

REFERENCE DOCUMENT

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Table 4. 9 Stage 1 Conceptual model for Bolingbrook Hill SAC (002124)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source - Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Species-rich *Nardus* Grassland* (6230) Northern Atlantic Wet Heath (4010) European Dry Heath (4030)	Construction	Movement of soils and machinery/ Earthworks and Excavations/ Runoff/Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/ Use of cement based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage	Excavations/ Runoff and SW Flows/ SW Flowpaths/ GW Flowpaths/ Nitrogen Deposition Soils	Habitat degradation via Groundwater level effects/ Suspended Solid Input/ Morphological Effects/ Groundwater and Surface Water Contamination/ Nutrient Input/ Habitat Degradation from the spread of Invasive Species	1: UWF Grid Connection	1: UWF Grid Connection: 6.3km	No potential for Significant effects due to distance and the absence of surface and groundwater hydrological connection.	1.UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 7.2km	No potential for Significant effects due to distance and the absence of surface and groundwater hydrological connection.	2.UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 8.1km	No potential for Significant effects due to distance and the absence of surface and groundwater hydrological connection.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 6.9km	No potential for Significant effects due to distance and the absence of surface and groundwater hydrological connection.	4. Consented Upperchurch WF **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 6.3km	No potential for Significant effects due to distance and the absence of surface and groundwater hydrological connection.	5. UWF Other Activities **Screened Out**
Conclusion: There are no direct effects on this European Site due to distance. No source pathway link for secondary effects exists due to distance and absence of hydrological connectivity (the EU site is upstream and up gradient). As such, it can reasonably be concluded no likely significant effect on this EU Site will occur.								

* Priority Annex I habitat †Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

REFERENCE DOCUMENT

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Table 4.10 Stage 1 Conceptual model for Clare Glen SAC (000930)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
Old sessile oak woods (91A0) Killarney Fern (Trichomanes speciosum)	Construction	Movement of soils and machinery/ Earthworks and Excavations/ Runoff/ Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/ Use of cement based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage	Excavations/Runoff and SW Flows/SW Flowpaths/GW Flowpaths/Nitrogen Deposition	Habitat degradation via Groundwater level effects/ Suspended Solid Input/ Morphological Effects/ Groundwater and Surface Water Contamination/ Nutrient Input/ Habitat Degradation	1: UWF Grid Connection	1: UWF Grid Connection: 4.5km	Distance and limited connectivity preclude the potential for significant adverse effects, taking account of the Conservation Objectives specified for these Qualifying Interests and the absence of direct or indirect habitat loss or disturbance.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 17km	Distance and limited connectivity preclude the potential for significant adverse effects, taking account of the Conservation Objectives specified for these Qualifying Interests and the absence of direct or indirect habitat loss or disturbance.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 20km	Distance and limited connectivity preclude the potential for significant adverse effects, taking account of the Conservation Objectives specified for these Qualifying Interests and the absence of direct or indirect habitat loss or disturbance.	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 18.2km	Distance and limited connectivity preclude the potential for significant adverse effects, taking account of the Conservation Objectives specified for these Qualifying Interests and the absence of direct or indirect habitat loss or disturbance.	4: Upperchurch Windfarm Screened **Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
					5: UWF Other Activities	5: UWF Other Activities: 4.5km	Distance and limited connectivity preclude the potential for significant adverse effects, taking account of the Conservation Objectives specified for these Qualifying Interests and the absence of direct or indirect habitat loss or disturbance.	5: UWF Other Activities **Screened Out**
Conclusion: There are no Direct Effects on this European Site. The potential for significant secondary effects on old oak woodlands/Killarney Fern is considered with regard to the downstream distance to the EU site (11.7km hydrologically at its closest) and limited connectivity preclude the potential for significant adverse effects, taking account of the Conservation Objectives specified for these Qualifying Interests and the absence of direct or indirect habitat loss or disturbance. In the absence of any probable source-pathway links it can reasonably be concluded no likely significant effects will occur on the Qualifying Interests of this European Site.								

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

REFERENCE DOCUMENT

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Table 4. 11 Stage 1 Conceptual model for Curraghchase Woods SAC (000174)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Alluvial Forests* (91E0) Yew Woodlands * (91J0)	Construction	Use of Fuels and Chemicals	SW Flowpaths/ GW Flowpaths	Habitat degradation via Groundwater and Surface Water Contamination	1: UWF Grid Connection	1: UWF Grid Connection: 33.5km	No potential for significant effects due to distance.	**1:** UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 50.6km	No potential for significant effects due to distance.	**2:** UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 53.8km	No potential for significant effects due to distance.	**3:** UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 50.6km	No potential for significant effects due to distance.	**4:** Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 9.3km	No potential for significant effects due to brief duration and low frequency of passing) traffic along an established roadway.	**5:** UWF Other Activities **Screened Out**
Lesser Horseshoe Bat *(Rhinolophus hipposideros)*	Construction	Noise and human activity/ Movement of Vehicles	Air	Disturbance/ Displacement	1: UWF Grid Connection	1: UWF Grid Connection: 33.5km	No potential for significant effects due to distance. The published maximum foraging distance of Lesser Horseshoe bat is 6km.	**1:** UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 50.6km	No potential for significant effects due to distance. The published maximum foraging distance of Lesser Horseshoe bat is 6km.	**2:** UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 52km	No potential for significant effects due to distance. The published maximum foraging distance of Lesser Horseshoe bat is 6km.	**3:** UWF Replacement Forestry **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 50.6km	No potential for significant effects due to distance. The published maximum foraging distance of Lesser Horseshoe bat is 6km.	**4:** Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 9.3km	No direct effects. Secondary effects via disturbance to Bats are considered not likely to occur. The nearest works comprise street furniture removal and reinstatement which will not result in likely signficant disturbance levels to Bats and effects lessened by distance.	**5:** UWF Other Activities **Screened Out**
Conclusion: There are no direct effects on habitats of qualifying interest. Secondary effects from use of Fuel /spillage are considered as the haulage route passes adjacent to the European site. However the brief duration and low frequency of passing (development) traffic along an established roadway reduces effects to no likely significant effects. In addition, substantive buffers exist between road routes and identified Qualifying Interest habitats. There is no additional potential for significant impacts on this EU site due to distance/absence of Hydrological connection. The nearest works are minimal and comprise street furniture removal and reinstatement as part of Project Element 5. The Main threats to the European Site are vandalism, forest management and use, and landfill or land reclamation. As such, it can reasonably be concluded no likely significant effect on these Qualifying Interest's habitat/European site will occur. There will be no direct effects on the Lesser Horseshoe bat. It is considered that secondary effects via disturbance to Bats are not likely to occur. The nearest works comprise street furniture removal and reinstatement which will not result in likely significant disturbance levels to Bats, with effects lessened by distance both between the nearest works and Curraghchase (9.3km) and also the separation buffer between the roadway and the established roost in the ruins of Curraghchase Mansion (c.3km). Passing traffic during delivery of components will not result in likely significant disturbance to foraging bats. The main threats to the European Site are vandalism, forest management and use, and land fill or land reclamation. As such, it can reasonably be concluded no likely significant effect on this Qualifying Interest species will occur.							

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

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Table 4.12 Stage 1 Conceptual model for Glenomra Wood SAC (001013)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Old sessile oak woods (91A0)	Construction	Movement of soils and machinery/ Earthworks and Excavations/ Runoff/ Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/ Use of cement-based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage	Excavations/ Runoff and SW Flows/ SW Flowpaths/ GW Flowpaths/ Nitrogen Deposition	Habitat degradation via Groundwater level effects/ Suspended Solid Input/ Morphological Effects/ Groundwater and Surface Water Contamination/ Nutrient Input/ Habitat Degradation	1: UWF Grid Connection	1: UWF Grid Connection: 11.2km	No potential for significant effects on this habitat due to distance and absence of pathways, e.g. hydrological connectivity.	**1:** UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 31.4km	No potential for significant effects on this habitat due to distance and absence of pathways, e.g. hydrological connectivity.	**2**: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 33.4km	No potential for significant effects on this habitat due to distance and absence of pathways, e.g. hydrological connectivity.	**3:** UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 32km	No potential for significant effects on this habitat due to distance and absence of pathways, e.g. hydrological connectivity.	**4:** Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 9.1km	No potential for significant effects on this habitat due to distance and absence of pathways, e.g. hydrological connectivity.	**5:** UWF Other Activities **Screened Out**
Conclusion – There are no direct effects on the European site under consideration. Secondary effects via habitat degradation are considered but concluded as not likely to occur, due to distance and absence of hydrological connectivity. The Main threats to this European Site are grazing and utility (electricity and phone lines). It can reasonably be concluded that there is no likelihood of significant effects on this Qualifying Interest/European Site.								

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects

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Table 4.13 Stage 1 Conceptual model for Glenstal Wood SAC (001432)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
Killarney Fern (*Trichomanes speciosum*)	Construction	Movement of soils and machinery/ Earthworks and Excavations/ Runoff/ Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/ Use of cement based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage	Excavations/ Runoff and SW Flows/ SW Flowpaths/ GW Flowpaths/ Nitrogen Deposition/ Soils	Habitat degradation via Groundwater level effects/ Suspended Solid Input/ Morphological Effects/ Groundwater and Surface Water Contamination/ Nutrient Input/ Habitat Degradation/ Habitat degradation via the spread of non-native invasive species	1: UWF Grid Connection	1: UWF Grid Connection: 5.8km	The absence of a hydrological connection and distance to any source of effects precludes significant effects. No pathway exists for the transfer of invasive species from the project element to the European Site.	**1:** UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 17.1km	The absence of a hydrological connection and distance to any source of effects precludes significant effects. No pathway exists for the transfer of invasive species from the project element to the European Site.	**2:** UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 20.2km	The absence of a hydrological connection and distance to any source of effects precludes significant effects. No pathway exists for the transfer of invasive species from the project element to the European Site.	**3:** UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 18km	The absence of a hydrological connection and distance to any source of effects precludes significant effects. No pathway exists for the transfer of invasive species from the project element to the European Site.	**4:** Upperchurch Windfarm **Screened Out**

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					5: UWF Other Activities	5: UWF Other Activities: 5.8km	The absence of a hydrological connection and distance to any source of effects precludes significant effects. No pathway exists for the transfer of invasive species from the project element to the European Site.	**5:** UWF Other Activities **Screened Out**
Conclusion – There are no direct effects on the European site under consideration. No source pathway linkage for secondary Habitat Degradation (either alone or in combination) effects exists. Secondary effects via Habitat Degradation from Water Quality related effects are considered. In the absence of a hydrological connection and given the distance to any source of effects no significant effects are considered likely. The dispersion of non-native invasive species via adherence to soil/vehicles has also been considered. No haul routes for the any project elements occur in close proximity to the European site. No pathway exists therefore for the transfer of same from the respective Project Elements to the European Site. The Main threats to the European Site are removal of forest undergrowth and non-native invasive species. As such, it can reasonably be concluded that no likely significant effect on this Qualifying Interest habitat/ European site will occur.								

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

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Table 4.14 Stage 1 Conceptual model for Keeper Hill SAC (001197)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Blanket Bogs (* if active bog) (7130) Northern Atlantic Wet Heath (4010)	Construction	Earthworks and Excavations/ Runoff/ Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/ Use of cement based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage/ Movement of soils and machinery	Excavations/ Runoff and SW Flows/ SW Flowpaths/ GW Flowpaths/ Nitrogen Deposition Soils	Habitat degradation via Groundwater level effects/ Suspended Solid Input/ Morphological Effects/ Groundwater and Surface Water Contamination/Nutrient Input/ Habitat Degradation Spread of non-native invasive species	1: UWF Grid Connection	1: UWF Grid Connection 2km	No potential for significant Groundwater or Surface Water effects due to distance, and lack of surface water hydrological connection.	**1:** UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works 10.9km	No potential for significant Groundwater or Surface Water effects due to distance, and lack of surface water hydrological connection.	**2:** UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry 12.1km	No potential for significant Groundwater or Surface Water effects due to distance, and lack of surface water hydrological connection.	**3:** UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 10.7	No potential for significant Groundwater or Surface Water effects due to distance, and lack of surface water hydrological connection.	**4:** Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 2km	Haulage routes/Access roads for the proposed Development do not overlap the EU site boundary no potential for transfer of invasive species. No potential for significant Groundwater or Surface Water effects due to distance, and lack of surface water hydrological connection.	**5:** UWF Other Activities **Screened Out**
Conclusion – There are no direct effects on the European site under consideration. There is no potential for significant Groundwater or Surface Water effects due to distance (2km). The European Site is topographically upslope of the Development and there is no surface water hydrological connection. No source pathway link exists for secondary habitat degradation via surface water or groundwater flow paths. Secondary effects are considered unlikely as source pathway links do not overlap the EU Site boundary. As such, it can reasonably be concluded that no likely significant effect on this Qualifying Interest will occur. No pathway exists for the transfer of invasive species from the respective project elements to the European Site. Haulage routes/Access roads do not overlap the European site boundary. The closest point from any possible source effect is 2km distant. As such, it can reasonably be concluded that no likely significant effect on this Qualifying Interest habitats/ European site will occur.								

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

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Table 4.15 Stage 1 Conceptual model for Kilduff, Devilsbit Mountain SAC (000934)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
Species-rich *Nardus* Grassland* (6230) European Dry Heath (4030)	Construction	Movement of soils and machinery/Earthworks and Excavations/Runoff/ Tree felling/Storage of Overburden/Use of Fuels and Chemicals/Use of cement based compounds/Frack out/ Dewatering/Forestry replanting/ Brash Storage	Excavations/ Runoff and SW Flows/SW Flowpaths/GW Flowpaths/ Nitrogen Deposition	Habitat degradation via Groundwater level effects/Suspended Solid Input/Morphological Effects/Groundwater and Surface Water Contamination/Nutrient Input/Habitat Degradation	1: UWF Grid Connection	1: UWF Grid Connection 16.9km	No potential for significant effects on this habitat due to distance, minimal depth of excavations proposed (in respect of Groundwater) and absence of hydrological connection.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works 13.7km	No potential for significant effects on this habitat due to distance, minimal depth of excavations proposed (in respect of Groundwater) and absence of hydrological connection.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 16.1km	No potential for significant effects on this habitat due to distance, minimal depth of excavations proposed (in respect of Groundwater) and absence of hydrological connection.	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 13.3km	No potential for significant effects on this habitat due to distance, minimal depth of excavations proposed (in respect of Groundwater) and absence of hydrological connection.	4: Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 8.7km	No potential for significant effects on this habitat due to distance minimal depth of excavations proposed (in respect of Groundwater) and absence of hydrological connection.	5: UWF Other Activities **Screened Out** -
Conclusion: No Direct effects. No source pathway linkage for secondary Habitat Degradation effects exists. No potential for significant effects on this habitat due to distance (8.7km), minimal depth of excavations proposed (in respect of Groundwater) and absence of hydrological connection. The main threats to the European Site are Forestry, Fertilisation, Grazing, Habitation and Road development. As such, it can reasonably be concluded that no likely significant effect on this Qualifying Interest/European Site will occur.								

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

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Table 4.16 Stage 1 Conceptual model for Lough Derg (Shannon) SPA (004058)

Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project element to European site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
Cormorant (*Phalacrocorax carbo*) Tufted Duck (*Aythya fuligula*) Goldeneye (*Bucephala clangula*) Common Tern (*Sterna hirundo*) Wetland and Waterbirds	Construction	Noise and Human Activity Movement of soils and machinery/Earthworks and Excavations/Runoff/Tree felling/Storage of Overburden/Use of Fuels and Chemicals/Use of cement-based compounds/frack out/Dewatering/forestry replanting/Brash Storage/Land	Visibility Excavations/Runoff and SW Flows/SW Flowpaths/GW Flowpaths/ Nitrogen Deposition/ Land Cover/Contact	Disturbance/ Displacement. Habitat degradation via Groundwater level effects/ Suspended Solid Input/ Morphological Effects/ Groundwater and Surface Water Contamination/ Nutrient Input/Habitat Degradation/Habitat Loss/Mortality	1: UWF Grid Connection	1. UWF Grid Connection 10.4km	No potential for likely significant disturbance on Bird Species due to distance, variation in habitat types and absence of Hydrological connectivity (to act as transit corridors/linkage). No Significant effects via habitat degradation due to absence of hydrological connectivity and distance.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2. UWF Related Works 24.5km	No potential for likely significant disturbance on Bird Species due to distance variation in habitat types and absence of Hydrological connectivity (to act as transit corridors/linkage). No Significant effects via habitat degradation due to absence of hydrological connectivity and distance.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3. UWF Replacement Forestry 25.3km	No potential for likely significant disturbance on Bird Species due to distance, variation in habitat types and absence of Hydrological connectivity (to act as transit corridors/linkage). No Significant effects via habitat degradation due to absence of hydrological connectivity and distance.	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4. Upperchurch Windfarm 27km	No potential for likely significant disturbance on Bird Species due to distance, variation in habitat types and absence of Hydrological connectivity (to act as transit corridors/linkage). No Significant effects via habitat degradation due to absence of hydrological connectivity and distance.	4: Upperchurch Windfarm **Screened Out**

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Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project element to European site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
					5. UWF Other Activities	5. UWF Other Activities 8.1km	No potential for likely significant disturbance on Bird Species due to distance, variation in habitat types and absence of Hydrological connectivity (to act as transit corridors/linkage). No Significant effects via habitat degradation due to absence of hydrological connectivity and distance.	5. UWF Other Activities **Screened Out**

Conclusion: There are no Direct effects on the European Site. Secondary effects such as disturbance to birds (wildfowl) are herein considered as are secondary effects via habitat degradation. No source impact pathway linkage exists for disturbance to wildfowl species. The potential for significant effects on water bird species is avoided due to distance, variation in habitat types (unsuitable versus suitable) between the whole UWF project respective elements receiving environment and the EU Site, and the absence of Hydrological connectivity (to act as transit corridors/linkage).

The main threats to the EU Site are Nautical Sports/Hunting/Fishing/Fertilisation. As such, it can reasonably be concluded that no likely significant effect on these Species of Conservation Interest / the European Site will occur.

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

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Table 4-17 Stage 1 Conceptual model for Lough Derg, North-East Shore SAC (002241)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Cladium Fens* (7210) Limestone Pavement* (8240) Alluvial Forests* (91E0) Yew Woodlands* (91J0) Alkaline Fens (7230) Juniper Scrub (5130)	Construction	Movement of soils and machinery/ Earthworks and Excavations/ Runoff/ Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/ Use of cement based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage Movement of soils and machinery	Excavations/ Runoff and SW Flows/ SW Flowpaths/ GW Flowpaths/ Nitrogen Deposition Soils	Habitat degradation via Groundwater level effects/Suspended Solid Input/ Morphological Effects/ Groundwater and Surface Water Contamination/ Nutrient Input/ Habitat Degradation Habitat degradation via the introduction of non-native invasive species.	1: UWF Grid Connection	1: UWF Grid Connection 25.3km	No potential for significant effects due to distance and the absence of pathways, e.g. hydrological connection.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works 28.5km	No potential for significant effects due to distance and the absence of pathways, e.g. hydrological connection.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry 29.5 km	No potential for significant effects due to distance and the absence of pathways, e.g. hydrological connection.	3: UWF Replacement Forestry **Screened Out**
					4. Consented Windfarm	4. Consented Windfarm 29km	No potential for significant effects due to distance and the absence of pathways, e.g. hydrological connection.	4. Consented Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities 12.9km	No potential for significant effects due to distance and the absence of pathways, e.g. hydrological connection.	5: UWF Other Activities **Screened Out**
Conclusion: There is no potential for direct effects on this European Site. No source pathway linkage (such as hydrological links) for secondary Habitat Degradation effects exists. Development (Piers), Eutrophication, Quarrying or Mining, Invasive Species, Pollution and Roads are the main threats. It can reasonably be concluded no likely significant effect on this Qualifying Interest habitat will occur.								

* Priority Annex I habitat. † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

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Table 4.18 Stage 1 Conceptual model for Lower River Shannon SAC (002165)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Alluvial Forests* (91E0)	Construction	Land take/Movement of soils and machinery/ Instream Works/Excavation Works/ Sediment/ Forestry Felling/ Overburden Storage/ Permanent Access Roads and Hardstanding/ Drilling/ Hydrocarbons/ Storage of Brash/ Use of Cement Based Compounds/ Dewatering of excavations/ Groundworks/ Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)/Reinstatement	Landcover/ Direct Contact/ Soils/ Runoff/ Ground & Surface Water Flowpaths/Surface water/Nitrogen Deposition/ Ground Vibrations	Riparian Habitat Degradation Disturbance to Fisheries Spread of Aquatic Invasive Species Decrease in habitat quality via: surface water runoff, sediment entrainment or release; release of fuels oils/ chemicals; surface/ground water quality impacts; changes in flow regime;	1: UWF Grid Connection	1: UWF Grid Connection: SAC 0km	No direct habitat loss within the SAC; however, due to proximity and the nature of the proposed works required, the following potential significant effects cannot be excluded: Riparian Habitat Degradation Spread of Aquatic Invasive Species Decrease in aquatic habitat quality via: Surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ ground water quality impacts, changes in flow regime. No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	1.UWF Grid Connection **Screened In**
					2: UWF Related Works	2: UWF Related Works 1.5km	No direct habitat loss within the SAC; however, due to proximity and the nature of the proposed works required, the following potential significant effects cannot be excluded: Riparian Habitat Degradation Spread of Aquatic Invasive Species Decrease in aquatic habitat quality via: Surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ ground water quality impacts, changes in flow regime. No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	2.UWF Related Works **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
					3: UWF Replacement Forestry	3: UWF Replacement Forestry 4.1km	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm 2.7km	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	4. Consented Upperchurch WF **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: SAC 0km	The Site is spanned by the overhead line as part of possible re-stringing activities however impact pathways are absent to Alluvial Forest; potential for significant effects can be excluded.	5. UWF Other Activities **Screened Out**
Conclusion: There are no direct effects on this habitat- however in respect of the UWF Grid Connection Project Element proximity and the nature of the proposed works (in particular instream works at river crossings) required means the potential for significant effects such as habitat degradation from potential Water Quality effects cannot be excluded. The absence of impact pathways precludes effects from remaining project Elements.								
Large shallow inlets and bays (1160)/ Estuaries (1130)/ Mudflats and sand flats (1140)/ Reefs (1170)/	Construction	Reinstatement/Sediment/Instream Works/Machinery Movement/ Excavation Works/ Dewatering of excavations/ Permanent Access Roads and Hardstanding/ Cement based materials/ Forestry Felling/Hydrocarbons/	Surface Water Flowpaths/ Landcover/ Surface Water/ Soils/ Nitrogen Deposition/	Riparian Habitat Degradation/ Spread of Aquatic Invasive Species/ Decrease in habitat quality through: surface water runoff, sediment entrainment or release; release of fuels oils/ chemicals; surface/ground water	1: UWF Grid Connection	1: UWF Grid Connection: SAC 0km	These habitats all occur west of Limerick City which is at least 34km downstream[7] from the nearest crossing of the Mulkear River or or a tributary thereof. Potential for significant effects are excluded due to the nature of the required works (their scale and extent), distance of separation and the significant dispersal and dilution within the sub-catchment introduced as a result.	1.UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works 1.5km	1.7km of internal windfarm cabling and a single watercourse crossing (WW23- which is 67.5km upstream from Limerick via the	2.UWF Related Works **Screened Out**

[7] See NPWS (2012) "Lower River Shannon (site code 2165) Conservation Objectives supporting Document – coastal Habitats V1" and NPWS (2012) " Lower River Shannon (site code 2165) Conservation Objectives supporting Document – Lagoon habitats V1", available online at (https://www.npws.ie/sites/default/files/publications/pdf/002165_Lower%20River%20Shannon%20SAC%20Coastal%20Supporting%20Doc_V1.pdf) and (https://www.npws.ie/sites/default/files/publications/pdf/002165_Lower%20River%20Shannon%20SAC%20Lagoons%20Supporting%20Doc_V1.pdf).

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Coastal Lagoons* (1150)/ Sandbanks (1110)/ Atlantic salt meadows (1330)/ Salicornia mudflats (1310)/ Mediterranean salt meadows (1410)/		Overburden Storage/ Storage of Brash/ Groundworks/Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)		quality impacts; changes in flow regime;			Bilboa River) occurs within the Shannon Catchment. Potential for significant effects can be excluded based on distance of separation the limited footprint of works and the significant dilution and dispersion within the sub-catchment.	
					3: UWF Replacement Forestry	3: UWF Replacement Forestry 4.1km	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm 2.7km	No instream works required, and only 2 turbines are located within contributing lands of the River Shannon Catchment. No potential for significant effects due to absence of impact pathways, the small footprint of works within the catchment, and distance of separation; potential for significant effects can be excluded.	4. Consented Upperchurch WF **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: SAC 0km	UWF Other Activities are required at Foynes but are limited to Street Furniture removal and reinstatement within the existing public road. There are no impact source or exposure pathways which would have potential for significant effects on these coastal / estuarine habitats, arising from these, or any of the proposed Other Activities. This takes account of the scale, duration and extent of the activities, the absence of connectivity to impact pathways and the sensitivities of the Qualifying Interest receptors. On this basis, the potential for significant effects can be excluded.	5. UWF Other Activities **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Conclusion: No direct effects on these habitats. No source pathway linkage for secondary Habitat Degradation effects within these coastal and transitional waters; either alone or in combination. Potential for significant effects are excluded on distance of separation; the scale, extent and duration of the proposal and the sensitivities of these Qualifying Interests in relation to impact sources identified. The nature of works in closest proximity (5: UWF Other Activities - street furniture removal within the existing road corridor) preclude the likelihood of significant effects. It can reasonably be concluded no likely significant effect on these Qualifying Interest habitats will occur.								
Vegetated sea cliffs (1230)/ Vegetation of stony banks (1220)	Construction	Movement of soils and machinery/ Instream Works/Excavation Works/Forestry Felling/Hydrocarbons/Reinstatement/Overburden Storage/ Dewatering of excavations/ Storage of Brash	Soils/ Landcover/ Surface Water Flowpaths/ Nitrogen Deposition/ Ground water flowpaths	Decrease in habitat quality through sediment entrainment or release/or release of fuels oils and chemicals/ Spread of Aquatic Invasive Species/ Riparian habitat degradation	1: UWF Grid Connection	1: UWF Grid Connection: SAC 0km	Sea cliffs are recorded from the south coast of the Loop Head peninsula and north coast of Kerry at Ballybunion/Kerry Head. The nearest location for Stony Banks/Shingle beaches to the Development is Ballymacrinan Bay. No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	1.UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works 1.5km west	Sea cliffs are recorded from the south coast of the Loop Head peninsula and north coast of Kerry at Ballybunion/Kerry Head. The nearest location for Stony Banks/Shingle beaches to the Development is Ballymacrinan Bay. No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	2.UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry 4.1km west	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm 2.7km west	Sea cliffs are recorded from the south coast of the Loop Head peninsula and north coast of Kerry at Ballybunion/Kerry Head. The nearest location for Stony Banks/Shingle	4. Consented Upperchurch WF **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
							beaches to the Development is Ballymacrinan Bay. No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	
					5: UWF Other Activities	5: UWF Other Activities: SAC 0km	Sea cliffs are recorded from the south coast of the Loop Head peninsula and north coast of Kerry at Ballybunion/Kerry Head. The nearest location for Stony Banks/Shingle beaches to the Development is Ballymacrinan Bay. No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	5. UWF Other Activities **Screened Out**
Conclusion: No direct effects. No source pathway linkage for secondary Habitat Degradation effects within these coastal habitats; either alone or in combination. The nature of works in closest proximity (5: UWF Other Activities - street furniture removal and reinstatement) preclude the likelihood of significant effects. It can reasonably be concluded no likely significant effect on these Qualifying Interest habitats will occur.								
Floating river vegetation (3260)	Construction /Operation (maintenance and surface water runoff)	Land Take/ Reinstatement/ Sediment/ Movement of Soils/Instream Works/Machinery Movement/ Excavation Works/ Dewatering of excavations/ Permanent Access Roads and Hardstanding/ Forestry Felling/ Cement based materials/ Hydrocarbons/ Overburden Storage/	Soils/ Surface Water Flowpaths/ Movement of Soils/ Direct Contact/ Landcover/ Surface Water/ Nitrogen Deposition	Riparian Habitat Degradation Spread of Aquatic Invasive Species Decrease in aquatic habitat quality via: surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ground water quality impacts/ changes in flow regime	1: UWF Grid Connection	1: UWF Grid Connection: SAC 0km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest; potential for significant effects cannot be excluded. No direct habitat loss within the SAC; however, due to proximity and the nature of the proposed works required, the following potential significant effects require further examination: Riparian Habitat Degradation Spread of Aquatic Invasive Species Decrease in aquatic habitat quality via:	1.UWF Grid Connection **Screened In – Precautionary Principle**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
		Storage of Brash/ Groundworks/Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)					Surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ground water quality impacts Changes in flow regime. No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	
					2: UWF Related Works	2: UWF Related Works 1.5km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest; potential for significant effects cannot be excluded. No direct habitat loss within the SAC; however, due to proximity and the nature of the proposed works required, the following potential significant effects require further examination: Riparian Habitat Degradation Spread of Aquatic Invasive Species Decrease in aquatic habitat quality via: Surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ground water quality impacts Changes in flow regime.	2.UWF Related Works **Screened In – Precautionary Principle**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
							No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements. It is considered that decreases in instream aquatic habitat quality, changes to flow regime, riparian habitat degradation and the spread of Aquatic Invasive Species cannot be screened out; Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest; potential for significant effects cannot be excluded. Potential significant effects arising from nitrogen deposition can be excluded based on the limited extent of felling and the distance of separation.	
					3: UWF Replacement Forestry	3: UWF Replacement Forestry 4.1km west	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm 2.7km west	No potential for significant effects due to absence of impact pathways via instream works as part of 4; potential for significant effects can be excluded.	4. Consented Upperchurch WF **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: SAC 0km	No potential for significant effects due to absence of impact pathways; potential for significant effects can be excluded.	5. UWF Other Activities **Screened Out**
Conclusion: No significant effects are likely in respect of Project Elements 3, 4 and 5 which are screened out. As source pathway links exist in respect of Project elements 1, and 2, via surface water; there remains the potential for deterioration in downstream habitats which are hydrologically linked to the SAC.								

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyz-on marinus*) Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Construction	Land Take/ Reinstatement/ Sediment/Instream Works/Machinery Movement/ Excavation Works/ Dewatering of excavations/ Permanent Access Roads and Hardstanding/ Cement based materials/ Forestry Felling/Drilling/ Noise and Human Disturbanace/Hydrocarbons/ Overburden Storage/ Storage of Brash/ Groundworks/Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)	Movement of Soils/ Surface Water and Groundwater Flowpaths/ Movement of Machinery/Landcover/ Surface Water/ Visibility/ Ground and Air Vibrations/ Direct Contact/ Nitrogen Deposition	Riparian Habitat Degradation Disturbance to Fisheries Spread of Aquatic Invasive Species Decrease in habitat quality via: surface water runoff, sediment entrainment or release; release of fuels oils/ chemicals, surface/ground water quality impacts; changes in flow regime;	1: UWF Grid Connection	1: UWF Grid Connection: SAC 0km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest; potential for significant effects cannot be excluded. No direct habitat loss within the SAC; however, due to proximity and the nature of the proposed works required, the following potential significant effects require further examination: Riparian Habitat Degradation Disturbance to Fisheries Spread of Aquatic Invasive Species Decrease in habitat quality via: Surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ground water quality impacts Changes in flow regime. No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	1.UWF Grid Connection **Screened In – Precautionary Principle**
					2: UWF Related Works	2: UWF Related Works 1.5km west	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest; potential for significant effects cannot be excluded. No direct habitat loss within the SAC;	2.UWF Related Works **Screened In – Precautionary Principle**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
							however, due to proximity and the nature of the proposed works required, the following potential significant effects require further examination: Riparian Habitat Degradation Disturbance to Fisheries Spread of Aquatic Invasive Species Decrease in habitat quality via: surface water runoff, sediment entrainment or release;,release of fuels oils/ chemicals; surface/ground water quality impacts; Changes in flow regime. No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	
					3: UWF Replacement Forestry	3: UWF Replacement Forestry 4.1km west	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm 2.7km west	No potential for significant effects due to absence of impact pathways via instream works as part of 4; potential for significant effects can be excluded. Most of this project element is located within the headwaters of the River Suir.	4. Consented Upperchurch WF **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
					5: UWF Other Activities	5: UWF Other Activities: SAC 0km	No potential for significant effects due to absence of impact pathways; potential for significant effects can be excluded.	5. UWF Other Activities **Screened Out**
Conclusion: No significant effects are likely in respect of Project Element 3 -5 which have been screened out. As source pathway links exist via surface water in respect of Project elements 1 and 2 ; the potential for significant effects on aquatic habitats supporting fish and aquatic Qualifying Interests cannot be excluded.								
Otter (*Lutra lutra*)	Construction	Land Take/ Reinstatement/ Sediment/Instream Works/Machinery Movement/ Excavation Works/ Movement of Soils/ Construction Noise and Vibration/ Dewatering of excavations/ Permanent Access Roads and Hardstanding/ Cement based materials/ Forestry Felling/ Hydrocarbons/ Drilling/ Overburden Storage/ Storage of Brash/ Groundworks/Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)	Soils/ Surface Water Flowpaths/ Landcover/ Movement of Soils and Machinery/ Surface Water/ Nitrogen Deposition/Direct Contact/ Ground and Air Vibrations/	Riparian Habitat Degradation Disturbance to Fisheries Spread of Aquatic Invasive Species Decrease in habitat quality via: surface water runoff, sediment entrainment or release; release of fuels oils/ chemicals; surface/ground water quality impacts; changes in flow regime; Loss of Habitat Disturbance to Otter	1: UWF Grid Connection	1: UWF Grid Connection: SAC 0km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest; potential for significant effects cannot be excluded. No direct habitat loss within the SAC and there will be no permanent loss of aquatic habitat. However, disturbance, in particular from works such as drilling cannot be screened out. Due to proximity and the nature of the proposed works required, the following potential significant effects require further examination: Riparian Habitat Degradation Disturbance to Fisheries Spread of Aquatic Invasive Species Decrease in habitat quality via: surface water runoff, sediment entrainment or release; release of fuels oils/ chemicals; surface/ground water quality impacts; Changes in flow regime;	1.UWF Grid Connection **Screened In – Precautionary Principle**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
							Disturbance to Otter No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	
					2: UWF Related Works	2: UWF Related Works 1.5km west	1.7km of internal windfarm cabling and a single watercourse crossing (WW23 - which is 4.7km upstream of the European Site via the Bilboa River) occurs within the Shannon Catchment as part of this project element. WW23 is a drain with no fisheries value and the proposed crossing method will not involve instream works; rather the cable will be installed over or under the existing structure. There will be no loss of aquatic habitat; and decreases in instream aquatic habitat quality are considered unlikely at this upstream distance, given the current unsuitability of the feature as a foraging resource for Otter. The potential for significant secondary effects on Otter in this regard can be excluded. Following the precautionary principle, the probability of disturbance during construction works or activities on upstream foraging Otter from the Bilboa River is considered likely. Therefore the following potential significant effects require further examination:	2.UWF Related Works **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
							Disturbance to Otter No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	
					3: UWF Replacement Forestry	3: UWF Replacement Forestry 4.1km west	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded. Otter not recorded.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm 2.7km west	No Otter were recorded in baseline studies to inform the Upperchurch Windfarm. No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	4. Consented Upperchurch WF **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: SAC 0km	No potential for significant effects due to absence of impact pathways; potential for significant effects can be excluded.	5. UWF Other Activities **Screened Out**
Conclusion: No direct effects. No significant effects are likely in respect of Project Elements 3, 4 and 5 which have been screened out. As source pathway links exist via surface water in respect of Project elements 1 and disturbance in respect of project elements 1 and and 2; the potential for significant effects on aquatic habitats supporting Otter cannot be excluded.								
Freshwater Pearl Mussel	Construction	Land Take/ Reinstatement/ Sediment/Instream Works/Machinery Movement/ Excavation Works/ Dewatering of excavations/ Permanent Access Roads and	Soils/ Surface Water Flowpaths/ Landcover/ Surface Water/ Nitrogen Deposition	Riparian Habitat Degradation/ Spread of Aquatic Invasive Species/ Decrease in habitat quality through: surface water runoff; sediment entrainment or release; release of	1: UWF Grid Connection	1: UWF Grid Connection: SAC 0km	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	1.UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works 1.5km west	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	2.UWF Related Works **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
		Hardstanding/ Cement based materials/ Forestry Felling/Hydrocarbons/ Overburden Storage/ Storage of Brash/ Groundworks/Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)		fuels oils/chemicals; surface/ground water quality impacts; changes in flow regime/	3: UWF Replacement Forestry	3: UWF Replacement Forestry 4.1km west	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm 2.7km west	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	4. Consented Upperchurch WF **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: SAC 0km	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	5. UWF Other Activities **Screened Out**
Conclusion: No source pathway links exist in respect of Project elements as the cited Qualifying Interest population is in the Cloon River in County Clare, to the north of the River Shannon Estuary, which is hydrologically unconnected.								
Bottlenose Dolphin	Construction	Movement of soils and machinery/ Instream Works/Excavation Works/Forestry Felling/Hydrocarbons/Reinstatement/Overburden Storage/ Excavation Works/ Dewatering of excavations/ Groundworks/Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)	Soils/Surface Water Flowpaths/ Surface Water Quality/ Nitrogen Deposition	Decrease in habitat quality through sediment entrainment or release/or release of fuels oils and chemicals/ Spread of Aquatic Invasive Species	1: UWF Grid Connection	1: UWF Grid Connection: SAC 0km	All Bottlenose Dolphins occur within the coastal waters of the Shannnon Estuary, west of Limerick[8]. No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	1.UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works 1.5km west	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	2.UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry 4.1km west	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	3.UWF Replacement Forestry **Screened Out**

[8] See: Simon Berrow, Joanne O'Brien, Lisa Groth, Aoife Foley and Kerstin Voigt (2010) Bottlenose Dolphin SAC Survey 2010. Report to the National Parks and Wildlife Service. Shannon Dolphin and Wildlife Foundation. pp.24. Available online at (https://www.npws.ie/sites/default/files/publications/pdf/Berrow_et_al_2010_Bottlenose_Dolphin%20SAC_Survey.pdf).

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
					4: Upperchurch Windfarm	4: Upperchurch Windfarm 2.7km west	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	4. Consented Upperchurch WF **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: SAC 0km	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	5. UWF Other Activities **Screened Out**
Conclusion: Preferentially used habitat as described in the supporting documentation for the SAC is c.15km to the west of Foynes. Development related activities in closest proximity to this location are street furniture removal and minor works within the public road. Project Elements are evaluated as having no likelihood to give rise to significant disturbance related effects on Bottlenose Dolphin.								
Molinia meadows (6410)	Construction	Movement of soils and machinery/ Earthworks and Excavations/ Runoff/ Tree felling/ Storage of Overburden/ Permanent Access Roads and Hardstanding/ Drilling Pit Dewatering (Mulkear, Clare & Bilboa River Crossings)/ Use of Fuels and Chemicals/ Use of cement based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage	Excavations/ Soils/ Direct Contact/ Runoff and SW Flows/ GW Flowpaths/ Nitrogen Deposition	Habitat degradation via Groundwater level effects/Suspended Solid Input/Morphological Effects/Groundwater and Surface Water Contamination/Nutrient Input/Habitat Degradation	1: UWF Grid Connection	1: UWF Grid Connection: SAC 0km	This habitat type was not recorded within the baseline habitat study area buffer. No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	1.UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works 1.5km west	This habitat type was not recorded within the baseline habitat study area buffer. No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	2.UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry 4.1km west	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm 2.7km west	No potential for significant effects due to absence of impact pathways and distance of separation; potential for significant effects can be excluded.	4. Consented Upperchurch WF **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: SAC 0km	No potential for significant effects due to absence of impact pathways and	5. UWF Other Activities **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site**	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
							distance of separation; potential for significant effects can be excluded.	
Conclusion: There is no potential for direct effects on this Qualifying Interest. No source pathway linkage for secondary effects. It can reasonably be concluded that no likely significant effect on this Qualifying Interest habitat will occur due to distance, scale of effects at source and lack of interconnectedness.								

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

**The distance provided is the distance to the nearest boundary of the European Site. This does not reflect the distance to any habitats/receptors specifically under consideration which may occur at varying distances, from the closest point of any respective project element.

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Table 4.19 Stage 1 Conceptual model for Lower River Suir SAC (002137)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
Atlantic salt meadows (1330) Mediterranean salt meadows (1410)	Construction	Movement of soils/ Instream Works/ Machinery Movement/ /Excavation Works/Forestry Felling/Hydrocarbons /Reinstatement/Overburden Storage Reinstatement/Sediment/Instream Works/ Instream Works Use of Cement Based Compounds Dewatering of excavations Permanent Access Roads and Hardstanding	Soils/Surface Water Flowpaths Landcover/ Surface Water Soils/Direct Contact Surface Water Runoff and Surface Water Flowpaths Ground water flowpaths	Decrease in habitat quality via: sediment entrainment or release/or release of fuels oils and chemicals, surface/ground water quality impacts changes in flow regime Riparian Habitat Degradation Spread of Aquatic Invasive Species	1: UWF Grid Connection	1: UWF Grid Connection: 4.4km	Salt Meadows occur south of Waterford city which is >130km via hydrological links[9]. At this distance dilution will avoid any effects.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 3km	Salt Meadows occur south of Waterford city which is >130km via hydrological links. At this distance dilution will avoid any effects.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	Salt Meadows occur south of Waterford city which is >130km via hydrological links. At this distance dilution will avoid any effects.	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8km	Salt Meadows occur south of Waterford city which is >130km via hydrological links. At this distance dilution will avoid any effects.	4: Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 0m	Salt Meadows occur south of Waterford city which is >130km via hydrological links. At this distance dilution will avoid any effects.	5: UWF Other Activities **Screened Out**
Floating river vegetation (3260)	Construction	Land Take Reinstatement Sediment Movement of Soils Instream Works Machinery Movement Excavation Works	Soils/Surface Water Flowpaths Soils/ Surface Water Flowpaths/ Movement of	Riparian Habitat Degradation Spread of Aquatic Invasive Species Decrease in habitat quality via: surface	1: UWF Grid Connection	1: UWF Grid Connection: 4.4km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest; potential for significant effects cannot be excluded. No direct habitat loss within the SAC; however, due to proximity and the nature of the proposed works required, the following potential significant effects require further examination:	1: UWF Grid Connection **Screened In**

[9] See NPWS (2012). Lower River Suir SAC (site code: 002137) Conservation Objectives supporting documents – Coastal habitats V1. Available at (https://www.npws.ie/sites/default/files/publications/pdf/Lower%20River%20Suir%20SAC%20(002137)%20Conservation%20objectives%20supporting%20document%20%E2%80%93%20Coastal%20habitats%20[Version%201].pdf).

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
		Dewatering of excavations Permanent Access Roads and Hardstanding Cement based materials Hydrocarbons Overburden Storage Groundworks	Soils/ Surface Water	water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ground water quality impacts; changes in flow regime			Decrease in habitat quality via: surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals , surface/ground water quality impacts Changes in flow regime, Riparian habitat degradation and ; The spread of Aquatic Invasive Species No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	
					2: UWF Related Works	2: UWF Related Works: 3km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest; potential for significant effects cannot be excluded. No direct habitat loss within the SAC; however, due to proximity and the nature of the proposed works required, the following potential significant effects require further examination: Decrease in habitat quality via: surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals , surface/ground water quality impacts; Changes in flow regime, Riparian habitat degradation and The spread of Aquatic Invasive Species. Whilst effects from the consented Upperchurch Windfarm have previously been subject to Appropriate Assessment, the	2: UWF Related Works **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
							potential for in- combination effects with Related Works occurring within the upper Suir catchment has been considered with regard to source pathway links (surface water and ground water). As potential significant effects are identified for the UWF Related Works the potential for in combination effects cannot be excluded. No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	No requirement for instream works; no felling. No significant effects are likely in respect UWF Replacement Forestry and these are accordingly screened out.	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8km	The Upperchurch Windfarm has been consented based on the completed Appropriate Assessment determination by the Competent Authority. On the basis of all information provided it was concluded that the project would not give rise to significant adverse effects on any European Site.	4: Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 0m	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest; potential for significant effects cannot be excluded. No direct habitat loss within the SAC; however, due to proximity and the nature of the proposed works required, the following potential significant effects require further examination: Decrease in habitat quality via: surface water runoff, sediment entrainment or release,	5: UWF Other Activities **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
							release of fuels oils/ chemicals , changes in flow regime, riparian habitat degradation and the spread of Aquatic Invasive Species No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	
Alluvial Forests* (91E0) Hydrophilous tall herb fringe communities (6340) Old sessile oak woods (91A0) Yew woodlands* (91J0)	Construction	Movement of soils/ Instream Works/ Machinery Movement/ Excavation Works/Forestry Felling/Hydrocarbons /Reinstatement/Overburden Storage Use of Cement Based Compounds Dewatering of excavations Permanent Access Roads and Hardstanding	Soils/Surface Water Flowpaths Ground water flowpaths Runoff and Surface Water Flowpaths	Decrease in habitat quality via: sediment entrainment or release/or release of fuels oils and chemicals	1: UWF Grid Connection	1: UWF Grid Connection: 4.4km	Alluvial woodlands within the SAC occur at significant distances downstream; as do Old Sessile oak woods and Yew Woodlands. The separation distance (both to downstream locations and also the absence of connectivity from any watercourse to proximate woodland) limits impact pathways and precludes the likelihood of significant effects[10]. Hydrophilous tall herb fringe communites occur in association with alluvial woodlands and whilst it requires winter inundation; the scale of works proposed, distance of separation, dilution and dispersion, as well as the sensitivies of these Qualifying Interest receptors avoids effects. The limited scale of this project element within the River Suir Catchment (only the last c.1.2km of the UWF Grid Connection 110kV UGC route is located within the Clodiagh River local surface water body) support the evaluation that the	1: UWF Grid Connection **Screened Out**

[10] NPWS (2017) Conservation Objectives: Lower River Suir SAC 002137. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
							potential for significant effects can be excluded. No potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	
					2: UWF Related Works	2: UWF Related Works: 3km	Alluvial woodlands within the SAC occur at significant distances downstream; as do Old Sessile oak woods and Yew Woodlands. The separation distance (both to downstream locations and also the absence of connectivity from any watercourse to proximate woodland) limits impact pathways and precludes the likelihood of significant effects[11]. Hydrophilous tall herb fringe communites occur in association with alluvial woodlands and whilst it requires winter inundation; the scale of works proposed, distance of separation, dilution and dispersion, as well as the sensitivies of these Qualifying Interest receptors excludes the potential for significant effects. No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	2: UWF Related Works **Screened Out**

[11] NPWS (2017) Conservation Objectives: Lower River Suir SAC 002137. Version 1. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs.

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	Having regard to the impact source and pathways identified, the limited scale and extent of the works associated with tree planting, in addition to the distance of separation from the SAC and the sensitivities of the Qualifying Interest receptors excludes the potential for significant effects.	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8km	Alluvial woodlands occur at significant distances downstream; as do Old Sessile oak woods and Yew Woodlands. The separation distance (both to downstream locations and the in turn to riverside woodland) limits impact pathways and precludes the likelihood of significant effects. Hydrophilous tall herb fringe communites occur in association with alluvial woodlands and whilst it requires winter inundation, distance and available dilution / dispersion exclude the potential for significant effects.	4: Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 0m	Potential for significant effects is avoided due to the absence of the impact pathways, the nature of the various activities proposed which are limited in scale and extent, and also the sensitivities of the Qualifying Interest receptors.	5: UWF Other Activities **Screened Out**
Alluvial Forests* (91E0) Hydrophilous tall herb fringe communities (6340) Old sessile oak woods (91A0)	Construction	Reinstatement/Sediment/ Movement of soils/ Instream Works/ Machinery Movement/	Landcover/ Surface Water Surface Water	changes in flow regime Spread of Aquatic Invasive Species	1: UWF Grid Connection	1: UWF Grid Connection: 4.4km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest. No direct habitat loss within the SAC; however, the proposed works require 2 no. instream works locations in the Suir Catchment. Taking account of the nature of the proposed works, the distance of separation to these Qualifying Interest receptors and their sensitivities there are no potential significant effects identified which	1: UWF Grid Connection **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
Yew woodlands* (91J0)							could result in a decrease in habitat quality via changes in the flow regime downstream within the SAC. Site surveys identified that invasive species were not present within the works area. However, the potential for spread of invasive species via surface water pathways cannot be excluded with regard to Alluvial Forests (91E0). No other potential impact source/pathways are likely to give rise to significant effects (on the qualifying interests identified) alone or in-combination with other project Elements.	
					2: UWF Related Works	2: UWF Related Works: 3km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest. No direct habitat loss within the SAC; however, there are 6 no. natural stream crossings required, located at headwater streams (first / second order) of the Clodiagh River (5 no.), with 1 no. being located at a headwater stream of the Owenbeg River. Taking account of the nature of the proposed works, the distance of separation to these Qualifying Interest receptors and their sensitivities there are no potential significant effects identified which could result in a decrease in habitat quality via changes in the flow regime downstream within the SAC. Site surveys identified that invasive species were not present within the works area.	2: UWF Related Works **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
							However, the potential for spread of invasive species via surface water pathways cannot be excluded with regard to Alluvial Forests (91E0). No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	No requirement for instream works. No potential for significant effects identified in respect UWF Replacement Forestry, with regard to the nature of the proposed works, distance of separation and sensitivity of the Qualifying Interest receptors.	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8km	No potential for significant effects identified in respect Upperchurch Windfarm, with regard to the nature of the proposed works, distance of separation and sensitivity of the Qualifying Interest receptors; however, source pathway links exist (via Surface water and Ground water) to Alluvial forest downstream; therefore it is considered that the following potential effects cannot be excluded: Spread of Aquatic Invasive Species with regard to Alluvial Forests (91E0). No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	4: Upperchurch Windfarm **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
					5: UWF Other Activities	5: UWF Other Activities: 0m	No potential for significant effects identified in respect UWF Other Activities, with regard to the nature of the proposed works, distance of separation and sensitivity of the Qualifying Interest receptors.	5: UWF Other Activities **Screened Out**
Alluvial Forests* (91E0) Hydrophilous tall herb fringe communities (6340) Old sessile oak woods (91A0) Yew woodlands* (91J0)	Construction/Operation	Movement of soils/ Instream Works/ Machinery Movement/ /Excavation Works/Forestry Felling/Reinstatement	Soils/Direct Contact	Riparian Habitat Degradation	1: UWF Grid Connection	1: UWF Grid Connection: 4.4km	Riparian Habitat changes at source will not affect downstream habitats of this type due to distance, scale of effects at source (based on 2 no. instream works locations), and lack of interconnectedness. Significant effects can be excluded.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 3km	Riparian Habitat changes at source will not affect downstream habitats of this type due to distance, scale of effects at source, and lack of interconnectedness. Significant effects can be excluded.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	Planting works will take place by hand. There will be no instream works. There will be no forestry felling. During operational management will be similar to typical farming activities, non-intrusive and of insufficient magnitude to result in significant effects on habitats located at substantial separation distances downstream.	3: UWF Replacement Forestry **Screened Out-**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8km	Riparian Habitat changes at source in respect to Upperchurch Windfarm; will not affect downstream habitats of this type due to separation distance, the reduced scale of effects at source and lack of hydrological interconnectedness.	4: Upperchurch Windfarm **Screened Out-**
					5: UWF Other Activities	5: UWF Other Activities: 0m	No instream works, therefore no significant effects are likely in respect of UWF Other Activities and these are accordingly screened out	5: UWF Other Activities **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
Alluvial Forests* (91E0) Atlantic Salmon (Salmo salar) Atlantic salt meadows (1330) Hydrophilous tall herb fringe communities (6340) Old sessile oak woods (91A0) Yew woodlands* (91J0) Freshwater Pearl Mussel	Construction	Storage of Brash	Nitrogen Deposition	Aquatic Habitat Degradation	1: UWF Grid Connection	1: UWF Grid Connection: 4.4km	Based on the scale of felling proposed for UWF Grid Connection and taking account of the scale of overlap with the Suir Catchment, the distance of separation to these Qualifying Interest receptors and their sensitivities; there are no potential significant effects identified which could result in aquatic habitat degradation downstream within the SAC. The potential for significant effects can be excluded.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 3km	Based on the scale of felling proposed UWF Related Works and taking account of the scale of overlap with the Suir Catchment, the distance of separation to these Qualifying Interest receptors and their sensitivities; there are no potential significant effects identified which could result in aquatic habitat degradation downstream within the SAC. The potential for significant effects can be excluded.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	UWF Replacement Forestry does not include felling; potential significant effects can be excluded.	3: UWF Replacement Forestry **Screened Out-**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8km	Based on the scale of felling proposed for Upperchurch Windfarm and taking account of the scale of overlap with the Suir Catchment, the distance of separation to these Qualifying Interest receptors and their sensitivities; there are no potential significant effects identified which could result in aquatic habitat degradation downstream within the SAC. The potential for significant effects can be excluded.	4: Upperchurch Windfarm **Screened Out-**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
					5: UWF Other Activities	5: UWF Other Activities: 0m	UWF Other Activities does not include felling; potential significant effects can be excluded.	5: UWF Other Activities **Screened Out**
Freshwater Pearl-Mussel (*Margaritifera margaritifera*) (Note: The nearest known location of Freshwater Pearl Mussel is 17km downstream via hydrological links, within the Clodiagh River)	Constructi-on and Operation (maintenance and surface water flows)	Movement of soils/ Instream Works/ Machinery Movement/ /Excavation Works/Forestry Felling/Hydrocarbons /Reinstatement/Over burden Storage/Sediment 4.3 Use of Cement Based Compounds/ 4.4 Permanent Access Roads and Hardstanding /Dewatering of excavations	Soils/Surface Water and Ground Water Flowpaths Landcover/ Direct Contact	Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals, surface/ground water quality impacts changes in flow regime Disturbance to/or displacement of fish and Aquatic species Spread of Aquatic Invasive Species	1: UWF Grid Connection	1: UWF Grid Connection: 4.4km	The proposed Grid Connection works have limited overlap with the Suir catchment (n=2 instream works locations in the upper Clodiagh catchment). The works are located approximately 17km upstream from the nearest FPM population in the Clodiagh. It is noted that neither the Clodiagh (Tipperary) nor the Multeen FPM populations are identified within the Lower River Suir SAC Conservation Objectives, which focus on the Clodiagh (Portlaw) population. Due to the nature of the proposed works required, the following potential significant effects require further examination: Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals, surface/ground water quality impacts; Changes in flow regime, Riparian habitat degradation, Disturbance to/or displacement of fish and Aquatic species, and The spread of Aquatic Invasive Species No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	1: UWF Grid Connection **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
					2: UWF Related Works:	2: UWF Related Works: 3km	The works are located approximately 17km upstream from the nearest FPM population in the Clodiagh. It is noted that neither the Clodiagh (Tipperary) nor the Multeen FPM populations are identified within the Lower River Suir SAC Conservation Objectives, which focus on the Clodiagh (Portlaw) population. Due to the nature of the proposed works required, the following potential significant effects require further examination: Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals, surface/ground water quality impacts; Changes in flow regime, Riparian habitat degradation, Disturbance to/or displacement of fish and Aquatic species The spread of Aquatic Invasive Species No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.Whilst effects from the consented Upperchurch Windfarm have previously been subject to Appropriate Assessment, the potential for in- combination effects with Related Works is considered with regard to source pathway links (surface water and ground water). As potential significant effects are identified alone, the potential for in combination effects cannot be excluded.	2: UWF Related Works **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
							No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	Due to the nature of works proposed no significant effects are likely in respect of UWF Replacement Forestry.	3: UWF Replacement Forestry **Screened Out-**
					4: Upperchurch Windfarm:	4: Upperchurch Windfarm: 2.8 km	The Upperchurch Windfarm has been consented based on the completed Appropriate Assessment determination by the Competent Authority. On the basis of all information provided it was concluded that the project would not give rise to significant adverse effects on any European Site.	4: Upperchurch Windfarm **Screened Out-**
					5: UWF Other Activities:	5: UWF Other Activities: 0m	Notwithstanding the non-invasive nature of these activities it is considered that the precautionary principle applies and the potential for significant effects cannot be excluded. Due to the nature of the proposed works required, the following potential significant effects require further examination: Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals, surface/ground water quality impacts; Changes in flow regime, Riparian habitat degradation and The spread of Aquatic Invasive Species.	5: UWF Other Activities **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
							No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	
Freshwater Pearl-Mussel (*Margaritifera margaritifera*) (Note: The nearest known location of Freshwater Pearl Mussel is 17km downstream via hydrological links, within the Clodiagh River.)	Operational	Surface Water	Forestry Management	Acidification	1: UWF Grid Connection	1: UWF Grid Connection: 4.4 km	The distance of separation as well as the limited scale and extent of operational forestry management ensures no significant effects are likely / Potential for significant effects can be excluded.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 3 km	The limited extent of forestry management ensures no significant effects are likely / Potential for significant effects can be excluded.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	Based on the scale and nature of forestry proposed in UWF Replacement Forestry (Deciduous totalling 3.99Ha), the positive benefits of deciduous forestry in flood water management and silt control, in addition to separation distance (and hence dilution and dispersal) to the nearest population; no significant effects are likely.	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8 km	The limited extent of forestry management ensures no significant effects are likely / Potential for significant effects can be excluded.	4: Upperchurch Windfarm **Screened Out-**
					5: UWF Other Activities	5: UWF Other Activities: 0m	No significant effects are likely / Potential for significant effects can be excluded; trees will primarily be deciduous and the extent is limited within the context of downstream effects.	5: UWF Other Activities **Screened Out**
White-clawed Crayfish (*Austropotamobius pallipes*)	Construction/Operation (maintenan	Movement of soils/ Instream Works/ Machinery Movement/	Soils/ Surface Water and	Decrease in habitat quality via:sediment entrainment or	1: UWF Grid Connection	1: UWF Grid Connection: 4.4 km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest. Notwithstanding the limited overlap with the Suir catchment (n=2 instream works	1: UWF Grid Connection **Screened** In

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
	ce and surface water runoff)	/Excavation Works/Forestry Felling/Hydrocarbons /Reinstatement/Over burden Storage/Sediment Use of Cement Based Compounds Permanent Access Roads and Hardstanding Dewatering of excavations	Ground Water Flowpaths Landcover/ Direct Contact	release/or release of fuels oils and chemicals, surface/ground water quality impacts changes in flow regime Disturbance to/or displacement of Aquatic species Spread of Aquatic Invasive Species			locations in the Clodiagh), the following potential significant effects require further examination: Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals, surface/ground water quality impacts; Changes in flow regime, Riparian habitat degradation, Disturbance to/or displacement of Aquatic species; The spread of Aquatic Invasive Species No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	
					2: UWF Related Works	2: UWF Related Works: 3 km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest; potential for significant effects cannot be excluded. No direct habitat loss within the SAC; however, the following potential significant effects require further examination: Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals, surface/ground water quality impacts; Changes in flow regime,	2: UWF Related Works **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
							Riparian habitat degradation and The spread of Aquatic Invasive Species Whilst effects from the consented Upperchurch Windfarm have previously been subject to Appropriate Assessment, the potential for in- combination effects with Related Works is considered with regard to source pathway links (surface water and ground water). As potential significant effects are identified alone, the potential for in combination effects cannot be excluded. No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements.	
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	Due to the nature of works proposed no significant effects are likely in respect of UWF Replacement Forestry.	3: UWF Replacement Forestry **Screened Out-**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8 km	The Upperchurch Windfarm has been consented based on the completed Appropriate Assessment . On the basis of all information provided it was concluded that the project would not give rise to significant adverse effects on any European Site.	4: Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 0m	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest. Notwithstanding the non-invasive nature of these activities it is considered that the precautionary principle applies and potential significant effects on this QI cannot be excluded with regard to:	5: UWF Other Activities **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
							Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals, surface/ground water quality impacts; Changes in flow regime, Riparian habitat degradation The Spread of Aquatic Invasive Species No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements	
Sea Lamprey (*Petromyzon marinus*) Brook Lamprey (*Lampetra planeri*) River Lamprey (*Lampetra fluviatilis*) Atlantic Salmon (*Salmo salar*)	Construction /Operation (maintenance and surface water runoff)	Movement of soils/ Instream Works/ Machinery Movement/ /Excavation Works/Forestry Felling/Hydrocarbons /Reinstatement/Over burden Storage/Sediment Use of Cement Based Compounds Permanent Access Roads and Hardstanding Dewatering of excavations	Soils/Surface Water and Ground Water Flowpaths Landcover/ Direct Contact	Surface Water Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals, surface/ground water quality impacts ; changes in flow regime Disturbance to/or displacement of Aquatic species	1: UWF Grid Connection	1: UWF Grid Connection: 4.4 km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest. Notwithstanding the limited overlap with the Suir catchment (n=2 instream works locations in the Clodiagh) and the fact that there will be no direct habitat loss within the SAC; the following potential significant effects require further examination: Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals, surface/ground water quality impacts; Changes in flow regime Riparian habitat degradation The Spread of Aquatic Invasive Species No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements	1: UWF Grid Connection **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
				The Spread of Aquatic Invasive Species	2: UWF Related Works	2: UWF Related Works: 3 km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest. No direct habitat loss within the SAC; however, due to the nature of the proposed works required, the following potential significant effects require further examination: Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals, surface/ground water quality impacts; Changes in flow regime, Riparian habitat degradation , The Spread of Aquatic Invasive Species , Whilst effects from the consented Upperchurch Windfarm have previously been subject to Appropriate Assessment, the potential for in- combination effects with Related Works is considered with regard to source pathway links (surface water and ground water). As potential significant effects are identified alone, the potential for in combination effects cannot be excluded. No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements	2: UWF Related Works **Screened In**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	Due to the nature of works proposed no significant effects are likely in respect of UWF Replacement Forestry.	3: UWF Replacement Forestry **Screened Out-**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8 km	The Upperchurch Windfarm has been consented based on the completed Appropriate Assessment determination by the Competent Authority. On the basis of all information provided it was concluded that the project would not give rise to significant adverse effects on any European Site.	4: Upperchurch Windfarm **Screened Out-**
					5: UWF Other Activities	5: UWF Other Activities: 0m	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest. Notwithstanding the non-invasive nature of these activities it is considered that the precautionary principle applies and potential significant effects on this QI cannot be excluded with regard to: Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals, surface/ground water quality impacts; Changes in flow regime, Riparian habitat degradation The Spread of Aquatic Invasive Species No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements .	5: UWF Other Activities **Screened In**
Sea Lamprey (*Petromyzon marinus*) Brook Lamprey (*Lampetra planeri*)	Construction	Brash Storage	Nitrogen Deposition	Habitat Degradation	1: UWF Grid Connection	1: UWF Grid Connection: 4.4 km	Based on the scale of felling proposed (the scale and extent), distance of separation and the significant dispersal and dilution within the sub-catchment no significant effects are likely and the potential for significant effects can be excluded.	1: UWF Grid Connection **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
River Lamprey (*Lampetra fluviatilis*) Atlantic Salmon (*Salmo salar*)					2: UWF Related Works	2: UWF Related Works: 3 km	Based on the scale of felling proposed (the scale and extent), distance of separation and the significant dispersal and dilution within the sub-catchment no significant effects are likely and the potential for significant effects can be excluded.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	No Felling included in works.	3: UWF Replacement Forestry **Screened Out-**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8 km	Based on the scale of felling proposed (the scale and extent), distance of separation and significant dispersal and dilution within the sub-catchment no significant effects are likely and the potential for significant effects can be excluded.	4: Upperchurch Windfarm **Screened Out-**
					5: UWF Other Activities	5: UWF Other Activities: 0m	No felling included in works.	5: UWF Other Activities **Screened Out**
Twaite Shad (*Alosa fallax fallax*) (Note: On the Suir Twaite Shad spawn in calm waters about 1km upstream of the old bridge in Carrick-on-Suir (>100km via hydrological links).	Construction	Movement of soils/ Instream Works/ Machinery Movement/ /Excavation Works/Forestry Felling/Hydrocarbons /Reinstatement/Overburden Storage Storage of Brash	Soils/Surface Water Flowpaths Landcover/ Surface Water Soils/Direct Contact Surface Water Nitrogen Deposition	Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals changes in flow regime	1: UWF Grid Connection	1: UWF Grid Connection: 4.4 km	Spawning movement may be impeded by weirs or localised high gradient areas. Taking account of the scale and extent of the proposed works, connectivity to the SAC and distance to downstream populations, the potential for significant effects is excluded.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 3 km	Spawning movement may be impeded by weirs or localised high gradient areas. Taking account of the scale and extent of the proposed works, connectivity to the SAC and distance to downstream populations, the potential for significant effects is excluded.	2: UWF Related Works **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
				Riparian Habitat Degradation Spread of Aquatic Invasive Species	3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	Spawning movement may be impeded by weirs or localised high gradient areas. Taking account of the scale and extent of the proposed works, connectivity to the SAC and distance to downstream populations, the potential for significant effects is excluded.	3: UWF Replacement Forestry **Screened Out-**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8 km	Spawning movement may be impeded by weirs or localised high gradient areas. Taking account of the scale and extent of the proposed works, connectivity to the SAC and distance to downstream populations, the potential for significant effects is excluded.	4: Upperchurch Windfarm **Screened Out-**
					5: UWF Other Activities	5: UWF Other Activities: 0m	Spawning movement may be impeded by weirs or localised high gradient areas. Taking account of the scale and extent of the proposed works, connectivity to the SAC and distance to downstream populations, the potential for significant effects is excluded. Upstream records of this species are scarce and movement may be impeded by weirs or localised high gradient areas. Distance to downstream populations precludes effects.	5: UWF Other Activities **Screened Out**
Otter (*Lutra lutra*)	Construction	Land Use Change	Land Cover	Loss of Habitat	1: UWF Grid Connection	1: UWF Grid Connection: 4.4 km	The minimal extent of Project Element 1 within Suir Catchment (1.2km of cable, with 2 no. watercourse crossings) will not result in any significant habitat loss affecting non-riparian habitats. Taking account of the scale and extent of the proposed works and distance of separation to the SAC, the potential for significant habitat loss effects on Otter in the River Suir downstream can be excluded.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works:3km	The potential for significant effects can be excluded taking account of the scale and extent of the proposed works and distance	2: UWF Related Works **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
							of separation to the SAC, as well as the absence of Otter from the works area.	
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	The potential for significant effects can be excluded taking account of the scale and extent of the proposed works and distance of separation to the SAC, as well as the absence of Otter from the works area..	3: UWF Replacement Forestry **Screened Out-**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8km	The potential for significant effects can be excluded as Otter were not recorded in studies to inform the prior Appropriate Assessment.	4: Upperchurch Windfarm **Screened Out-**
					5: UWF Other Activities	5: UWF Other Activities: 0m	Given the minimal nature of the activities with no loss of riparian or riverine habitat associated with same and the distance of separation to the SAC, the potential for significant habitat loss effects on Otter in the River Suir downstream can be excluded.	5: UWF Other Activities **Screened Out**
Otter (*Lutra lutra*)	Construction	Operating Machinery	Direct Contact	Secondary Mortality of Otter.	1: UWF Grid Connection	1: UWF Grid Connection: 4.4 km	Direct contact with operating machinery in respect of Project Element 1 will not result in significant effects due to the scale, extent and duration of the proposed works, with limited connectivity to Otter populations associated with the River Suir SAC. No otter features were identified within the footprint of the proposed works. The potential for significant effects can be excluded.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 3 km	Otter were not recorded during thebaseline studies for UWF Related Works. Taking account of the scale, extent and duration of the proposed works, with limited connectivity to Otter populations associated with the River Suir SAC the potential for significant effects can be excluded.	2: UWF Related Works **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	Otter were not recorded during the baseline studies for UWF Replacmeent Forestry. Taking account of the scale, extent and duration of the proposed works, with limited connectivity to Otter populations associated with the River Suir SAC the potential for significant effects can be excluded.	3: UWF Replacement Forestry **Screened Out-**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8 km	Otter were not recorded during the 2012 baseline studies for Upperchurch Windfarm. Taking account of the scale, extent and duration of the proposed works, with limited connectivity to Otter populations associated with the River Suir SAC the potential for significant effects can be excluded.	4: Upperchurch Windfarm **Screened Out-**
					5: UWF Other Activities	5: UWF Other Activities: 0m	The potential for significant effects can be excluded based on the minimal nature of the activities as well as the scale, extent and duration of the proposed works, with limited connectivity to Otter populations associated with the River Suir SAC	5: UWF Other Activities **Screened Out**
Otter (*Lutra lutra*)	Construction	Noise and Operating Machinery	Ground and Air Vibrations	Disturbance/ Displacement of Otter	1: UWF Grid Connection	1: UWF Grid Connection: 4.4 km	The small degree of overlap with the upstream River Suir catchment (1.2km of cable, with 2 no. watercourse crossings) is evaluated with regard to the scale, extent and duration of the proposed works and the limited connectivity to Otter populations associated with the River Suir SAC. No otters or otter features were identified within the footprint of the proposed works. The potential for significant effects on downstream Otter in the River Suir can be excluded.	1: UWF Grid Connection **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
					2: UWF Related Works	2: UWF Related Works: 3 km	Otter were not recorded during the baseline studies for UWF Related Works. Taking account of the scale, extent and duration of the proposed works and the limited connectivity to Otter populations associated with the River Suir SAC the potential for significant effects can be excluded.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	Otter were not recorded during the baseline studies for the UWF Replacement Forestry, extent and duration of the proposed works and the limited connectivity to Otter populations associated with the River Suir SAC the potential for significant effects can be excluded	3: UWF Replacement Forestry **Screened Out-**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8 km	Otter were not recorded during the 2012 baseline studies for Upperchurch Windfarm. Taking account of the scale, extent and duration of the proposed works and the limited connectivity to Otter populations associated with the River Suir SAC the potential for significant effects can be excluded	4: Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 0m	Taking account of the scale, extent and duration of the proposed works and the limited connectivity to Otter populations associated with the River Suir SAC the potential for significant effects can be excluded.	5: UWF Other Activities **Screened Out**
Otter (*Lutra lutra*)	Construction /Operation (maintenance and surface water runoff)	Reinstatement/Sediment/ Movement of soils/ Instream Works/ Machinery Movement/	Landcover/ Surface Water Soils/Direct Contact	Changes in flow regime Riparian Habitat Degradation/	1: UWF Grid Connection	1: UWF Grid Connection: 4.4 km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest. Notwithstanding the small degree of overlap with the upstream River Suir catchment (1.2km of cable, with 2 no. watercourse crossings), potential significant	1: UWF Grid Connection **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
		Excavation Works/Forestry Felling/Reinstatement Use of Cement Based Compounds	Runoff and Surface Water Flowpaths	Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals, Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals ,surface/ground water quality impacts Spread of Aquatic Invasive Species			effects on this QI cannot be excluded with regard to: Changes in flow regime; Riparian habitat degradation; Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals ,surface/ground water quality impacts; Spread of Aquatic Invasive Species ; No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements	
					2: UWF Related Works	2: UWF Related Works: 3 km	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest. Notwithstanding that Otter were not recorded in baseline surveys, potential significant effects on this QI cannot be excluded with regard to: Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals ,surface/ground water quality impacts; Changes in flow regime, Riparian habitat degradation Spread of Aquatic Invasive Species It is considered that	2: UWF Related Works **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
							Whilst effects from the consented Upperchurch Windfarm have previously been subject to Appropriate Assessment, the potential for in- combination effects with Related Works is considered with regard to source pathway links (surface water and ground water). As potential significant effects are identified alone, the potential for in combination effects cannot be excluded. No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements	
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	Due to the nature and location of works proposed (extent, scale and duration) no significant effects are likely to affect Otter in respect of UWF Replacement Forestry. The potential for significant effects can be excluded.	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8 km	The Upperchurch Windfarm has been consented based on the completed Appropriate Assessment determination by the Competent Authority. On the basis of all information provided it was concluded that the project would not give rise to significant adverse effects on any European Site.	4: Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 0m	Source pathway links exist (via Surface water and Ground water) to the aquatic Qualifying Interest. Notwithstanding the non-invasive nature of these activities it is considered that the precautionary principle applies and potential significant effects on this QI cannot be excluded with regard to:	5: UWF Other Activities **Screened In**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
							Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals ,surface/ground water quality impacts; Changes in flow regime, Riparian habitat degradation Spread of Aquatic Invasive Species No other potential impact source/pathways are likely to give rise to significant effects alone or in-combination with other project Elements	
White-clawed Crayfish (Austropotamobius pallipes) Alluvial Forests* (91E0) Atlantic salt meadows (1330) Mediterranean salt meadows (1410) Hydrophilous tall herb fringe communities (6340)	Operational	Surface Water	Forestry Management	Acidification	1: UWF Grid Connection	1: UWF Grid Connection: 4.4 km	Due to the limited scale of management required, no significant acidification is considered likely. The potential for significant effects is excluded.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 3 km	Due to the limited scale of management required, no significant acidification is considered likely. The potential for significant effects is excluded.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 4.9km	Due to the limited scale of management required, no significant acidification is considered likely. The potential for significant effects is excluded.	3: UWF Replacement Forestry **Screened Out-**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 2.8 km	Due to the limited scale of management required, no significant acidification is considered likely. The potential for significant effects is excluded.	4: Upperchurch Windfarm **Screened Out-**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
Old sessile oak woods (91A0) Yew woodlands* (91J0) Floating river vegetation (3260) Otter (Lutra lutra) Sea Lamprey (Petromyzon marinus) Brook Lamprey (Lampetra planeri) River Lamprey (Lampetra fluviatilis) Twaite Shad (Alosa fallax fallax)					5: UWF Other Activities	5: UWF Other Activities: 0m	Due to the limited scale of management required, no significant acidification is considered likely. The potential for significant effects is excluded.	5: UWF Other Activities **Screened Out**
Conclusion: The possibility of likely significant effects cannot be excluded in respect of aquatic and water dependant qualifying interests of the SAC, including: Alluvial forest, Floating river vegetation, Freshwater Pearl Mussel, White-Clawed Crayfish, Lamprey species, Atlantic Salmon and Otter. This is primarily due to the potential for secondary effects on water quality and the potential for spread of invasive species, which when considered in the absence of environmental protection measures (including Project Design Measures/Best Practice Measures), requires evaluation within the NIS. Notwithstanding the separation distance to some receptors such as Freshwater Pearl Mussel (17km at minimum downstream) and the availability of dilution and dispersion in the intervening distance, a precautionary approach has been taken, in line with the precautionary principle.								

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects

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Table 4.20 Stage 1 Conceptual model for Philipston Marsh SAC (001847)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Transition mires and quaking bogs (7140)	Construction	Movement of soils and machinery/ Earthworks and Excavations/ Runoff/ Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/ Use of cement based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage	Excavations/ Runoff and SW Flows/ SW Flowpaths/ GW Flowpaths/ Nitrogen Deposition	Habitat degradation via Groundwater level effects/ Suspended Solid Input/ Morphological Effects/ Groundwater and Surface Water Contamination/ Nutrient Input/ Habitat Degradation	1: UWF Grid Connection	1: UWF Grid Connection: 13.1km	No potential for significant impacts due to distance and the absence of hydrological connection.	1.UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 13 km	No potential for significant impacts due to distance and the absence of hydrological connection.	2. UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 16.2km	No potential for significant impacts due to distance and the absence of hydrological connection.	3. UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 13.6 km	No potential for significant impacts due to distance and the absence of hydrological connection.	4.Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 13.9km	No potential for significant impacts due to distance and the absence of hydrological connection.	5.UWF Other Activities **Screened Out**
Conclusion: There are no direct effects on the European site under consideration. No source pathway linkage for secondary Habitat Degradation (either alone or in combination) effects exists. Grazing, Afforestation and Fertilisation are the main threats. It can reasonably be concluded no likely significant effect on this Qualifying Interest habitat/European site will occur.								

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects

REFERENCE DOCUMENT

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Table 4.21 Stage 1 Conceptual model for Ratty River Cave SAC (002316)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Caves (8310) Lesser Horseshoe Bat (*Rhinolophus hipposideros*)	Construction	Excavation Works Noise and human activity	Land Cover Visibility	Hedgerow Severance Disturbance/ Displacement	1: UWF Grid Connection	1: UWF Grid Connection: 24.6km	No potential for significant effects due to distance.	1. UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 44.5km	No potential for significant effects due to distance.	2. UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 46.8km	No potential for significant effects due to distance.	3. UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 25.6km	No potential for significant effects due to distance.	4. Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 14.8km	No potential for significant impacts due to distance.	5. UWF Other Activities **Screened Out**
Conclusion: There are no direct effects on the European Site under consideration. The main cited threats are Hedgerow removal and demolishment of Buildings. No demolishment is proposed. Consideration is given to Hedgerow Severance and Disturbance however no Development related severance occurs within 6km of the European Site, which is the maximum established foraging range for Lesser Horseshoe Bat. Due to the absence of any hedgerow severance within published maximum foraging range for Lesser Horseshoe Bats it is concluded that no likely significant effect on this Qualifying Interest will occur.								

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

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Table 4.22 Conceptual model for River Shannon and River Fergus Estuaries SPA (004077)

Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project element to European site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Cormorant (*Phalacrocorax carbo*)/ Whooper Swan (*Cygnus cygnus*)/ Light-bellied Brent Goose (*Branta bernicla hrota*)/ Shelduck (*Tadorna tadorna*)/ Wigeon (*Anas penelope*)/ Teal (*Anas crecca*)/ Pintail (*Anas acuta*)/ Shoveler (*Anas clypeata*)/ Scaup (*Aythya marila*)/ Knot (*Calidris canutus*)/ Ringed Plover (*Charadrius hiaticula*)/ Grey Plover (*Pluvialis squatarola*)/ Lapwing (*Vanellus vanellus*)/ Dunlin (*Calidris alpina*)/ Black-tailed Godwit (*Limosa limosa*)/ Bar-tailed Godwit (*Limosa lapponica*)/ Redshank (*Tringa totanus*)/ Greenshank (*Tringa nebularia*)/ Black-headed Gull (*Chroicocephalus ridibundus*)	Construction	Noise and Human Activity Movement of soils and machinery/Earthworks and Excavations/Runoff/Tree felling/Storage of Overburden/Use of Fuels and Chemicals/Use of cement-based compounds/Frack out/Dewatering	Visibility / Noise / Surface Water Runoff/ Surface Water flowpaths	Disturbance / Habitat Degradation / Nutrient Input/ Displacement/ Suspended Solid Input/ Surface Water Contamination	1: UWF Grid Connection	1: UWF Grid Connection: 16.9km West	No likelihood of significant disturbance on Bird Species due to separation distance. No records of these species from the affected works areas. No Significant effects via habitat degradation due to absence of hydrological connectivity and distance. Potential for significant effects can be excluded.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 34.5km West	No likelihood of significant disturbance on Bird Species due to separation distance. No records of these species from the affected works areas. No Significant effects via habitat degradation due to absence of hydrological connectivity and distance. Potential for significant effects can be excluded.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 37.5km West	No likelihood of significant disturbance on Bird Species due to separation distance. No records of these species from the affected works areas. No Significant effects via habitat degradation due to absence of hydrological connectivity and distance. Potential for significant effects can be excluded.	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 24.5km Northeast	No likelihood of significant disturbance on Bird Species due to separation distance. No records of these species from the affected works areas. No Significant effects via habitat degradation due to absence of hydrological connectivity and distance. Potential for significant effects can be excluded.	4: Upperchurch Windfarm **Screened Out**
					5. UWF Other Activities	5: UWF Other Activities:	No likelihood of significant disturbance on Bird Species due to separation distance. No records of these species from the affected works areas.	5. UWF Other Activities **Screened Out**

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Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project element to European site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
						354m northwest	No Significant effects via habitat degradation due to absence of hydrological connectivity and distance. Potential for significant effects can be excluded.	
Conclusion: No direct effects on the European Site via Land Cover or Physical Contact pathways, due to zero overlap between EU Site boundary and respective Project Elements. No likelihood of significant impacts at the closest project element to this SPA (haul route related activities-380m from SPA Boundary) due to species habituation to traffic and noise. No likelihood of significant secondary disturbance on these bird species listed as Species of Conservation Interest for this SPA, due to distance to remaining project elements (e.g. 16.9km to the UWF Grid Connection). No records of these Species of Conservation Interest bird species during dedicated baseline studies for the Development. Potential for significant effects can be excluded.								
Golden Plover (*Pluvialis apricaria*)/ Curlew (*Numenius arquata*)	Construction/ Operation	Noise and Human Activity Movement of soils and machinery/Earthworks and Excavations/Runoff/Tree felling/Storage of Overburden/Use of Fuels and Chemicals/Use of cement-based compounds/Frack out/Dewatering	Visibility / Noise / Surface Water Runoff/ Surface Water flowpaths	Disturbance / Habitat Degradation / Nutrient Input/ Displacement/ Suspended Solid Input/ Surface Water Contamination	1: UWF Grid Connection	1: UWF Grid Connection: 16.9km West	No likelihood of significant disturbance on these Species of Conservation Interest. No Significant effects via habitat degradation within the SPA due to absence of hydrological connectivity and distance. Although these species have been recorded from the UWF Grid Connection Study area, the low numbers of Golden Plover and single incidence of recorded Curlew breeding are considered unlikely to be connected to the SPA; and in the case of Curlew, the SPA is not designated for breeding birds, rather the winter based immigrant population. Potential for *ex situ* significant effects can be excluded.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 34.5km West	No likelihood of significant disturbance on these Species of Conservation Interest within the SPA boundary due to separation distance. No Significant effects via habitat degradation within the SPA due to absence of hydrological connectivity and distance. Potential for *ex situ* significant effects can be excluded.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry:	No likelihood of significant disturbance on these Species of Conservation Interest within the SPA boundary due to separation distance. No Significant effects via habitat degradation within	3: UWF Replacement Forestry **Screened Out**

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Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project element to European site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
						37.5km West	the SPA due to absence of hydrological connectivity and distance. Potential for *ex situ* significant effects can be excluded.	
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 24.5km Northeast	No likelihood of significant disturbance on these Species of Conservation Interest within the SPA boundary due to separation distance. No Significant effects via habitat degradation within the SPA due to absence of hydrological connectivity and distance. Potential for *ex situ* significant effects can be excluded.	4: Upperchurch Windfarm **Screened Out**
					5. UWF Other Activities	5: UWF Other Activities: 354m northwest	No likelihood of significant disturbance on these Species of Conservation Interest within the SPA boundary due to separation distance and habituation to existing road traffic. Potential for *ex situ* significant effects can be excluded.	5. UWF Other Activities **Screened Out**
Conclusion: No direct effects via Land Cover or Physical Contact pathways, due to zero overlap between EU Site boundary and Development Construction works boundary. No likelihood of significant impacts at the closest project element to this SPA (haul route related activities-380m from SPA Boundary) due to species habituation to traffic and noise.								
Wetland and Waterbirds	Construction	Noise and Human Activity Movement of soils and machinery/Earthworks and Excavations/Runoff/Tree felling/Storage of Overburden/Use of Fuels and Chemicals/Use of cement-	Visibility / Noise / Surface Water Runoff/ Surface Water flowpaths	Disturbance / Habitat Degradation / Nutrient Input/ Displacement/ Suspended Solid Input/ Surface Water Contamination	1: UWF Grid Connection	1: UWF Grid Connection: 16.9km West	No likelihood of significant disturbance on Bird Species or their supporting habitats, due to separation distance. No Significant effects via habitat degradation due to absence of hydrological connectivity and distance. Potential for significant effects can be excluded.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 34.5km West	No likelihood of significant disturbance on Bird Species or their supporting habitats, due to separation distance. No Significant effects via habitat degradation due to absence of hydrological connectivity and distance. Potential for significant effects can be excluded.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry:	No likelihood of significant disturbance on Bird Species or their supporting habitats due to separation distance. No Significant effects via	3: UWF Replacement Forestry

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Special Interest	Conservation	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project element to European site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
			based compounds/Frack out/Dewatering				37.5km West	habitat degradation due to absence of hydrological connectivity and distance. Potential for significant effects can be excluded.	**Screened Out**
						4: Upperchurch Windfarm	4: Upperchurch Windfarm: 24.5km Northeast	No likelihood of significant disturbance on Bird Species or their supporting habitats due to separation distance. No Significant effects via habitat degradation due to absence of hydrological connectivity and distance. Potential for significant effects can be excluded.	4: Upperchurch Windfarm **Screened Out**
						5. UWF Other Activities	5: UWF Other Activities: 354m northwest	No significant disturbance on Bird Species or their supporting habitats due to separation distance. No Significant effects via habitat degradation due to absence of hydrological connectivity and distance. Potential for significant effects can be excluded.	5. UWF Other Activities **Screened Out**
Conclusion: No direct effects via Land Cover or Physical Contact pathways, due to zero overlap between EU Site boundary and Development Construction works boundary. No likelihood of significant impacts at the closest project element to this SPA (haul route related activities-380m from SPA Boundary) due to species habituation to traffic and noise. No likelihood of significant secondary disturbance on the supporting habitats or SPA bird species, due to distance to remaining project elements (e.g. 16.9km to the UWF Grid Connection). No records of Species of Conservation Interest bird species during dedicated baseline studies for the Development. Potential for significant effects can be excluded.									

† Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

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Table 4.23 Stage 1 Conceptual model for Silvermine Mountain SAC (000939)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Species-rich *Nardus* Grassland* (6230) Northern Atlantic Wet Heath (4010	Construction	Earthworks and Excavations/ Runoff/ Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/ Use of cement-based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage/ Movement of soils and machinery	Excavations / Runoff and SW Flows/SW Flowpaths/ GW Flowpaths/ Nitrogen Deposition Soils	Habitat degradation via Groundwater level effects/ Suspended Solid Input/Morphological Effects/ Groundwater and Surface Water Contamination/ Nutrient Input/Habitat Degradation Introduction or Spread of non-native invasive species of Flora	1: UWF Grid Connection	1: UWF Grid Connection: 7.2km	No likelihood of significant effects due to distance and the absence of hydrological connection. The site is upstream and upgradient of the Development. No likelihood of invasive species transfer to these habitats due to separation distance.	1.UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 11.5km	No likelihood of significant effects due to distance and the absence of hydrological connection. The site is upstream and upgradient of the Development. No likelihood of invasive species transfer to these habitats due to separation distance.	2. UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 12.5km	No likelihood of significant effects due to distance and the absence of hydrological connection. The site is upstream and upgradient of the Development. No likelihood of invasive species transfer to these habitats due to separation distance.	3. UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 11 km	No likelihood of significant effects due to distance and the absence of hydrological connection. The site is upstream and upgradient of the Development. No likelihood of invasive species transfer to these habitats due to separation distance.	4. Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 8.5km	No likelihood of significant effects due to distance and the absence of hydrological connection. The site is upstream and upgradient of the Development.	5. UWF Other Activities **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
							No likelihood of invasive species transfer to these habitats due to separation distance /no haulage routes or delivery routes pass in proximity to the European Site.	
Conclusion: There are no direct effects on the European site under consideration. No source pathway link for invasive species transfer (secondary effects) exists due to distance and also as no haulage or delivery routes within proximity of the European site. No source pathway link for remaining secondary effects exists due to distance and absence of surface water and groundwater hydrological connectivity, the European site is upstream and upgradient. The main threats are Forestry, Invasive non-native species, roads, hedge removal, discharges, Attraction Parks and Grazing. It can reasonably be concluded no likely significant effect on these habitats of Qualifying interest/European Site will occur.								

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

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Table 4.24 Stage 1 Conceptual model for Silvermine Mountain West SAC (002258)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Northern Atlantic Wet Heath (4010) Calaminarian grasslands (6130) European Dry Heath (4030)	Construction	Movement of soils and machinery/ Earthworks and Excavations/ Runoff/ Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/ Use of cement based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage	Excavations /Runoff and SW Flows/SW Flowpaths/ GW Flowpaths/ Nitrogen Deposition Soils	Habitat degradation via Groundwater level effects/ Suspended Solid Input/ Morphological Effects/ Groundwater and Surface Water Contamination/ Nutrient Input/Habitat Degradation Introduction or Spread of non-native invasive species of Flora	1: UWF Grid Connection	1: UWF Grid Connection: 5.7 km	No likelihood of significant effects on these habitats due to distance, no hydrological connection and as the site is upstream and upgradient of the Project Element. Invasive species transfer; No likelihood of significant effects on these habitats due to distance and no haulage routes or delivery routes pass in proximity to the European Site.	1: UWF Grid Connection: **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 12.5 km	No likelihood of significant effects on these habitats due to distance, no hydrological connection and as the site is upstream and upgradient of the Project Element. Invasive species transfer; No likelihood of significant effects on these habitats due to distance and no haulage routes or delivery routes pass in proximity to the European Site.	2: UWF Related Works: **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 13.6km	No likelihood of significant effects on European Dry Heath (4030), Northern Atlantic Wet Heath (4010) and Calaminarian grasslands (6130) due to distance, no hydrological connection and as the site is upstream and upgradient of the Project Element. Invasive species transfer; No likelihood of significant effects on these habitats due to distance and no haulage routes or delivery routes pass in proximity to the European Site.	3: UWF Replacement Forestry: **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 11.2km	No likelihood of significant effects on European Dry Heath (4030), Northern Atlantic Wet Heath (4010) and Calaminarian grasslands (6130) due to distance, no hydrological connection and as the site is upstream and upgradient of the Project Element.	4: Upperchurch Windfarm: **Screened Out**

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Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
							Invasive species transfer; No likelihood of significant effects on these habitats due to distance and no haulage routes or delivery routes pass in proximity to the European Site.	
					5: UWF Other Activities	5: UWF Other Activities:9.5km	No likelihood of significant effects on European Dry Heath (4030), Northern Atlantic Wet Heath (4010) and Calaminarian grasslands (6130) due to distance, no hydrological connection and as the site is upstream and upgradient of the Project Element. Invasive species transfer; No likelihood of significant effects on these habitats due to distance and no haulage routes or delivery routes pass in proximity to the European Site.	5: UWF Other Activities: **Screened Out**
Conclusion: There are no direct effects on habitats of qualifying interest (Northern Atlantic Wet Heath (4010), Calaminarian grasslands (6130) and European Dry Heath (4030)) due to distance. No source pathway link for secondary effects exists due to distance and absence of hydrological connectivity as the European site is upstream and upgradient. Furthermore, with regard to the transfer of invasive species there are no direct effects on habitats of qualifying interest. No source pathway link for secondary effects exists due to distance and no haulage or delivery routes passing within proximity of the European Site. The main threats are Mining, Forestry, Grazing, and Habitation and Vehicle usage. It can reasonably be concluded that no likely significant effect on the habitats of qualifying interests European Site will occur. The main threats to the European Site are Mining, Forestry, Grazing, Habitation and Vehicle usage. It can reasonably be concluded that no likely significant effect on this EU Site will occur.								

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects

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Table 4.25 Stage 1 Conceptual model for Slieve Bernagh SAC (Site Code: 002312)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European site	Examination and Analysis of Identified Source – Possible Pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/ Precautionary Principle
Blanket Bogs (Active)* Wet Heath Dry Heath	Construction	Movement of soils and machinery/ Earthworks and Excavations/ Runoff/Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/Use of cement-based compounds/ frac out/Dewatering/ forestry replanting/ Brash Storage	Excavations/ Runoff and SW Flows/SW Flowpaths/GW Flowpaths/ Nitrogen Deposition	Habitat degradation via Groundwater level effects/ Suspended Solid Input/ Morphological Effects/ Groundwater and Surface Water Contamination/ Nutrient Input/Habitat Degradation	1: UWF Grid Connection	1: UWF Grid Connection: 11.5 km	No likelihood of significant impacts due to distance and the absence of hydrological connection.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 28.4km	No likelihood of significant impacts due to distance and the absence of hydrological connection.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 29.5km	No likelihood of significant impacts due to distance and the absence of hydrological connection.	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: 45.6km	No likelihood of significant impacts due to distance and the absence of hydrological connection.	4: Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 9.6km	No likelihood of significant impacts due to distance and the absence of hydrological connection.	5: UWF Other Activities **Screened Out**
Conclusion: There is no likelihood of significant effects on the European Site due to distance and the absence of hydrological connection. No direct effects are anticipated. No source pathway linkage for secondary Habitat Degradation effects exists. Off-road vehicles, forestry, fire (and suppression of) and peat extraction are the main threats. It can reasonably be concluded no likely significant effect on this Qualifying Interest habitat will occur.								

* Priority Annex I habitat †Potential effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

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Table 4.26 Stage 1 Conceptual model for Slievefelim to Silvermines SPA (004077)

Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance From Project Element to European Site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
Hen Harrier (*Circus cyaneus*)	Construction	Landuse Change	Land cover	Reduction in or Loss of Suitable Foraging Habitat	1: UWF Grid Connection	1: UWF Grid Connection: 0km	Potential for significant secondary effect on Hen Harrier such as Reduction and/or loss of foraging habitat, due to overlap with the SPA. .	1.UWF Grid Connection **Screened In**
					2: UWF Related Works	2: UWF Related Works: 0km	Potential for significant secondary effect on Hen Harrier such as the reduction and/or loss of foraging habitat, due to overlap with the SPA.	2: UWF Related Works **Screened In**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 1.4km	No direct effect as RF is outside the SPA. Existing lands are improved and not suitable for foraging Hen Harrier.	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: Adjacent to the western boundary of turbines T17 to T21	Outside the SPA. The Upperchurch Windfarm has been consented based on the findings of the completed Appropriate Assessment determination by the Competent Authorityprocess. On the basis of all information provided it was concluded that the project would not give rise to significant adverse effects on any European Site.	4: Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 0m	No activities will include land cover changes other than the consented Upperchurch Hen Harrier Scheme.	5: UWF Other Activities **Screened Out**
Hen Harrier (*Circus cyaneus*)	Construction /Operational Maintenance	Forestry Felling/Operating Machinery	Contact	Inadvertent Mortality of Hen Harrier in	1: UWF Grid Connection	1: UWF Grid Connection: SPA 0km	Screened in following the precautionary principle (alone or in combination).	1.UWF Grid Connection **Screened In**
					2: UWF Related Works	2: UWF Related Works: SPA 0km	As these locations are linked primarily to the consented UWF lands, which have been established as not containing suitable breeding habitat or evidence of winter roosting birds; then the locations of UWF Related Works can similarly	2.UWF Related Works **Screened In**

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Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance From Project Element to European Site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
				or at Nest or Roost Sites			be excluded from source impact pathway linkage in terms of disturbance. Locations not linked to Internal Windfarm Cabling such as Haul Route Works including turning areas for turbine delivery (e.g. HW7) or hedgerow trimming locations, do not currently constitute viable breeding or roosting habitat. However due to the precautionary principle and the possibility of suitability at a future point effects cannot be excluded (alone or in combination).	
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: SPA 1.4km	Lands do not constitute breeding or roosting habitat for Hen Harrier.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: Adjacent to the western boundary of turbines T17 to T21	No Hen Harrier breeding or roosting habitat occurs within the wind farm works area boundary, nor have birds been recorded utilising the project element location for activities other than foraging. The Upperchurch Windfarm has been consented based on the findings of the completed Appropriate Assessment determination by the Competent Authorityprocess. On the basis of all information provided it was concluded that the project would not give rise to significant adverse effects on any European Site.	4. Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: SPA 70m	Screened In based on Monitoring Activites occurring in possible proximity to Nesting/Roosting harriers.	5. UWF Other Activities **Screened In**
Hen Harrier (*Circus cyaneus*)	Construction	Noise and human activity			1: UWF Grid Connection	1: UWF Grid Connection: 0km	Screened in following the precautionary principle (alone or in combination). .	1.UWF Grid Connection **Screened In**

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Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance From Project Element to European Site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
			Visibility	Disturbance/Displacement of Nesting/ Roosting Hen Harrier	2: UWF Related Works	2: UWF Related Works: 0km	Foraging birds will not be appreciably affected. As locations are linked primarily to the consented UWF which has been established as not containing suitable breeding habitat or evidence of winter roosting birds; then the locations of related works can similarly be excluded from source impact pathway linkage in terms of disturbance. Locations not linked to wind farm construction such as turning areas for turbine delivery (e.g. HW7) or hedgerow trimming locations, do not currently constitute viable breeding or roosting habitat. However due to the precautionary principle and the possibility of suitability at a future point effects cannot be excluded (alone or in combination).	2.UWF Related Works **Screened In**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 1.4km	No effects as planting will be done by hand and comparable to typical farming activities.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: Adjacent to the western boundary of turbines T17 to T21	No Hen Harrier breeding or roosting habitat occurs within the wind farm works area boundary, nor have birds been recorded utilising the project element location for activities other than foraging. The Upperchurch Windfarm has been consented based on the findings of the completed Appropriate Assessment determination by the Competent Authorityprocess. On the basis of all information provided it was concluded that the project would not give rise to significant adverse effects on any European Site.	4. Upperchurch Windfarm **Screened Out**

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Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance From Project Element to European Site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
					5: UWF Other Activities	5: UWF Other Activities: 70m	Activities involving street furniture removal or activities on public roads will not act as a significant source of noise or intrusion. Line stringing related activities does not constitute a significant source of disturbance. Screened In based on Monitoring Activites occurring in possible proximity to Nesting/Roosting harriers.	5. UWF Other Activities **Screened In**
Hen Harrier (*Circus cyaneus*)	Operational	Land Cover/permanent Structures	Land use change/ Contact	Additive mortality due to improved access/collision	1: UWF Grid Connection	1: UWF Grid Connection: 0km	Additive mortality due to improved access to previously inaccessible locations by humans during operation is considered. There will be no increase in accessibility. All improved/new roads will have gates which will be locked. No collision risk is present.	1.UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: 0km	Additive mortality from collision with the proposed Relay Pole is herein considered. There is no precedent in the literature for this structure as a collision risk (akin to telegraph pole).	2.UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 1.4km west	There is no potential collision risk. There will be no increase in availability of access to lands.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: Adjacent to the western boundary of turbines T17 to T21	Additive mortality from operational stage collision with the already Upperchurch Windfarm (alone or in combination with other plans or projects) has already been evaluated as not significant. There will be no increase in availability of access to lands.	4. Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: 70m	There is no potential for collision risk. There is no precedent for an evaluation of significance in respect of activities connected to Killonan Line.	5. UWF Other Activities **Screened Out**

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Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance From Project Element to European Site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
							There will be no increase in availability of access to lands.	
Hen Harrier (*Circus cyaneus*)	Operational	Noise or Visual intrusion from Maintenance or management	Air and Visibility	Disturbance/displacement	1: UWF Grid Connection	1: UWF Grid Connection: 0km	Screened in following the precautionary principle (alone or in combination).	1.UWF Grid Connection **Screened In**
					2: UWF Related Works	2: UWF Related Works: 0km	There is no likelihood of significant effects to foraging birds. As locations are linked primarily to the consented UWF which has been established as not containing suitable breeding habitat or evidence of winter roosting birds; then the locations of related works can similarly be excluded from source impact pathway linkage in terms of disturbance as a result of operational maintenance work. Locations not linked to wind farm construction such as turning areas for turbine delivery (e.g. HW7 if utilised in the event of a blade replacement or similar) or hedgerow trimming locations, do not currently constitute viable breeding or roosting habitat. However due to the precautionary principle and the possibility of suitability at a future point effects cannot be excluded (alone or in combination)..	2.UWF Related Works **Screened In**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 1.4km west	All works will be done by hand and/or are equivalent to typical farming activities. There will be no increase in availability of access to lands.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: Adjacent to the western boundary of turbines T17 to T21	The low frequency of works ensures no likely significant effect. In addition no Breeding Hen Harrier habitat occurs within the wind farm. There will be no increase in availability of access to lands. There is no likelihood of significant effects to foraging birds. Significant effects (alone or in combination).can be excluded.	4. Upperchurch Windfarm **Screened Out**

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Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance From Project Element to European Site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
					5: UWF Other Activities	5: UWF Other Activities: 70m	All works will be minimal (e.g. Hedgerow trimming or stringing related activities) or equivalent to typical farming activities (Upperchurch Hen Harrier Scheme). There will be no increase in availability of access to lands. There is no likelihood of significant effects to foraging birds. Howver in the absence of the consideration of Mitigation, likely significant effects from monitoring within the SPA cannot be excluded.	5. UWF Other Activities **Screened In**
Hen Harrier (*Circus cyaneus*)	Construction	Land Use Change	In combination effects (from multiple developments/ agriculture /turbary/ Forestry)	Reduction in or Loss of Suitable Foraging Habitat	1: UWF Grid Connection	1: UWF Grid Connection: SPA 0km	In combination effects on Hen Harriers utilising the EU Site from multiple developments is considered. Following the precautionary principle; Possibly significant secondary effects are considered likely	1.UWF Grid Connection **Screened In**
					2: UWF Related Works	2: UWF Related Works: SPA 0km	In combination effects on Hen Harriers utilising the EU Site from multiple developments is considered. Following the precautionary principle; Possibly significant secondary effects are considered likely.	2.UWF Related Works **Screened In**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: SPA 1.4km west	In combination effects are not possible as the RF lands are outside the SPA and currently sub-optimal for Hen Harrier foraging. No likely significant in combination effect.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: Adjacent to the western boundary of turbines T17 to T21	Following the precautionary principle; Possibly significant effects are considered likely (Windfarm in combination with remaining project elements plus other projects) Outside the SPA. The Upperchurch Windfarm has been consented based on the findings of the completed Appropriate Assessment determination by the Competent Authorityprocess. On the basis of all information provided it was concluded that the project would not give rise to significant adverse effects on any European Site.	4. Upperchurch Windfarm **Screened In**

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Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance From Project Element to European Site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
					5: UWF Other Activities	5: UWF Other Activities: SPA 70m southwest	No source of in combination habitat loss comprises part of Other Activities. No potential therefore for in combination effects. The Upperchurch Hen Harrier Scheme requires further evaluation.	5. UWF Other Activities **Screened In**
Hen Harrier (*Circus cyaneus*)	Construction	Land Use Change	Land Cover	Loss of Nesting Habitat	1: UWF Grid Connection	1: UWF Grid Connection: SPA 0km	No suitable nesting habitat will undergo land use change or land take.	1.UWF Grid Connection **Screened Out**
					2: UWF Related Works	2: UWF Related Works: SPA 0km	No suitable nesting habitat will undergo land use change or land take.	2.UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: SPA 1.4km west	No suitable nesting habitat will undergo land use change or land take.	3.UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm	4: Upperchurch Windfarm: Adjacent to the western boundary of turbines T17 to T21	No suitable nesting habitat will undergo land use change or land take.	4. Upperchurch Windfarm **Screened Out**
					5: UWF Other Activities	5: UWF Other Activities: SPA 70m southwest	No suitable nesting habitat will undergo land use change or land take.	5. UWF Other Activities **Screened Out**

Conclusion:
The potential for a reduction in or loss of suitable foraging habitat is screened in given the overlap between the UWF Grid Connection and Related Works project elements and the land use change described in the project description. Inadvertant mortality of 'in-situ' nesting or roosting Hen Harrier is also screened in following the precautionary principle as Element 1 overlaps known breeding or winter roosting areas and UWF Related Works, although currently unsuitable, may be suitable at some point in the future. Disturbance and displacement of nesting or winter roosting birds is also screened in due to the route of the UWF Grid Connection element occurring in close proximity to established nesting areas. In combination effects with other developments and activities such as forestry and agriculture or turbary is consequently also screened in following the precautionary principle.
As no suitable nesting habitat is to undergo land use change then there will be no change in availability of nesting habitat and effects are consequently screened out.

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Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance From Project Element to European Site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
Additive mortality from both collision and possible persecution from the availability of increased access has been considered however, as the collision risk from the operational wind farm (project consented Upperchurch Windfarm) has already been evaluated as not significant, and there is no precedent for a collision risk in terms of Hen Harrier from structures associated with other project elements (such as the Telecoms Relay Pole, the proposed Mountphilips Substation, or in relation to stringing activities) then additive in combination mortality from collision is screened out. There will be no likely significant increase in access as a possible pathway for persecution of Hen Harriers (most lands will remain under private control) and therefore there is no likelihood of significant effects along this pathway. Potential effects on Hen Harrier through land use change in respect of foraging habitat , in addition to disturbance effects and the possibility of inadvertent mortality of nesting or roosting birds on the ground requires further evaluation (alone and in combination) at Stage 2.								

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects

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Table 4.27 Stage 1 Conceptual model for Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)

Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance From project Element to European Site	Examination and Analysis of Identified Source - Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
Hen Harrier (*Circus cyaneus*)	Construction	Landtake/ Forestry Felling/Noise and Human Activity	Land Cover/Contact/ Visibility	Reduction in Prey Item Species/ Mortality/ Disturbance or Displacement	1: UWF Grid Connection:	1: UWF Grid Connection: 50.9Km	The distance to the European site eliminates effects (alone or in combination).	1: UWF Grid Connection: **Screened Out**
					2: UWF Related Works:	2: UWF Related Works: 67.3km	The distance to the European site eliminates effects (alone or in combination).	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 70.7km	The distance to the European site eliminates effects (alone or in combination).	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm:	4: Upperchurch Windfarm: 64.7km	The distance to the European site eliminates effects (alone or in combination).	4: Upperchurch Windfarm: **Screened Out**
					5: UWF Other Activities:	5: UWF Other Activities: 5.9km	The non-contiguousness of the EU Site eliminates effects (alone or in combination). In addition the Haulage route is along established roads and will not affect Hen Harrier within the European Site.	5: UWF Other Activities: **Screened Out**
Hen Harrier (*Circus cyaneus*))	Construction	Land take			1: UWF Grid Connection:	1: UWF Grid Connection: 50.9Km	Significant effects (either alone or in combination) can be excluded based on the separation distance to the European Site.	1: UWF Grid Connection: **Screened Out**
					2: UWF Related Works:	2: UWF Related Works: 67.3km	Significant effects (either alone or in combination) can be excluded based on the separation distance to the European Site.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry:	Significant effects (either alone or in combination) can be excluded based	3: UWF Replacement Forestry

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Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance From project Element to European Site	Examination and Analysis of Identified Source - Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
						70.7km	on the separation distance to the European Site.	**Screened Out**
			In combination effects	Reduction in or Loss of Foraging Habitat /Reduction in Nesting Habitat/Loss of Winter Roosts/	4: Upperchurch Windfarm:	4: Upperchurch Windfarm: 64.7km	Significant effects (either alone or in combination) can be excluded based on the separation distance to the European Site.	4: Upperchurch Windfarm: **Screened Out**
					5: UWF Other Activities:	5: UWF Other Activities: 5.9km	Significant effects (either alone or in combination) can be excluded based on the separation distance to the European Site. No land take is associated with the UWF Other Activities which may impact on Hen Harrier.	5: UWF Other Activities: **Screened Out**
Hen Harrier (*Circus cyaneus*)	Operational	Rotating Turbines or other vertical obstructions/ Landuse Change	Contact/Increased access	Mortality	1: UWF Grid Connection:	1: UWF Grid Connection: 50.9Km	No source of collision mortality with birds in flight exists for this element.	1: UWF Grid Connection: **Screened Out**
					2: UWF Related Works:	2: UWF Related Works: 67.3km	Contact pathways are avoided through distance to the Telecoms Relay Pole; there is no precedent for Hen Harrier mortality with this type of structure.	2: UWF Related Works **Screened Out**
					3: UWF Replacement Forestry	3: UWF Replacement Forestry: 70.7km	No source of mortality exists for this element	3: UWF Replacement Forestry **Screened Out**
					4: Upperchurch Windfarm:	4: Upperchurch Windfarm: 64.7km	Additive mortality from operational stage collision with the already consented Upperchurch Windfarm (alone or in combination with other plans or projects) has already been evaluated as not significant. Notwithstanding this, the distance	4: Upperchurch Windfarm: **Screened Out**

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Special Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance From project Element to European Site	Examination and Analysis of Identified Source - Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
							also avoids the likelihood of significant effects.	
					5: UWF Other Activities:	5: UWF Other Activities: 5.9km	No source of mortality exists for this element	5: UWF Other Activities: **Screened Out**

Conclusion:

There are no direct effects on the European Site. Secondary effects during construction and operation are considered herein in respect of Hen Harrier. Source pathway links do not overlap the EU Site boundary and the separation distance to the European Site from possible source effects on Hen Harrier populations is significant. A precautionary approach has therefore been taken in the consideration of effects.

Contact pathways as a source of mortality are avoided through distance to operational turbines (c.70km). Distance (51km from the EU Site to the next nearest CWB location) and the non-contiguousness of the EU Site also eliminates effects (alone or in combination) such as in combination loss of foraging habitat, or disturbance- as population connectivity is not likely at this separation distance. Research on the spatial ecology of Hen Harriers has shown that foraging females spend most of their time within 1km of the nest, while males hunt mostly within 2km of the nest (Arroyo et al., 2009, Irwin et al., 2012, Arroyo et al., 2014). Additive mortality from operational stage collision with the already Upperchurch Windfarm (alone or in combination with other plans or projects) has already been evaluated and found to not result in adverse effects on the integrity of the European Site. As levels of increased access at source is not considered probable, and the construction works boundary does not overlap the EU site then land use change effects such as increased potential for additive mortality as a result of access are screened out.

It can reasonably be concluded that there is no likelihood of significant effects on this European Site .

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

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Table 4.28 Stage 1 Conceptual model for Tory Hill SAC (000439)

Qualifying Interests	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Individual Project Element under consideration	Distance from Project Element to European Site	Examination and Analysis of Identified Source – Possible pathway-Receptor links	Screened Out at Stage 1 with Justification or Screened in with Justification/Precautionary Principle
Orchid-rich Calcareous Grassland* (6210) *Cladium Fens** *(7210) Alkaline Fens (7230)*	Construction	Movement of soils and machinery/ Earthworks and Excavations/ Runoff/ Tree felling/ Storage of Overburden/ Use of Fuels and Chemicals/ Use of cement based compounds/ Frack out/ Dewatering/ Forestry replanting/ Brash Storage	Excavations/Runoff and SW Flows/GW Flowpaths/Nitrogen Deposition	Habitat degradation via Groundwater level effects/ Suspended Solid Input/ Morphological Effects/ Groundwater and Surface Water Contamination/ Nutrient Input/Habitat Degradation	1: UWF Grid Connection	1: UWF Grid Connection: 27.3km	No likelihood of significant impacts due to distance and the absence of hydrological connection.	1: UWF Grid Connection **Screened Out**
					2: UWF Related Works:	2: UWF Related Works: 40.4km	No likelihood of significant impacts due to distance and the absence of hydrological connection.	2: UWF Related Works: **Screened Out**
					3: UWF Replacement Forestry:	3: UWF Replacement Forestry: 43.9km	No likelihood of significant impacts due to distance and the absence of hydrological connection.	3; UWF Replacement Forestry: **Screened Out**
					4: Upperchurch Windfarm:	4: Upperchurch Windfarm: 42km	No likelihood of significant impacts due to distance and the absence of hydrological connection.	4: Upperchurch Windfarm: **Screened Out**
					5: UWF Other Activities:	5: UWF Other Activities: 10.3km	No likelihood of significant impacts due to distance and the absence of hydrological connection.	5: UWF Other Activities: **Screened Out**
Conclusion: There is no likelihood of direct effects on this European Site. No source pathway linkage exists for secondary effects. Changes in hydraulic conditions from infilling of water/drainage features and goat grazing are the main threats. It can reasonably be concluded no likely significant effect on this Qualifying Interest habitat/European Site will occur.								

* Priority Annex I habitat † Effects include direct, indirect or secondary, either alone or in combination with other plans and projects.

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4.5 Stage One Screening Conclusion

The screening appraisal provided herein has examined potential effects via source pathway linkages on the designated SACs and SPAs within 15km of the Whole UWF Project. There is a total of 23 no. European or Natura 2000 sites located within the 15km zone of consideration. Following screening it can reasonably be concluded that there is **no** possibility of Significant Effects on 20 of these 23 European sites as a result of the Development. These are listed as follows:

1. Anglesey Road SAC (002125)
2. Askeaton Fen Complex SAC (002279)
3. Barrigone SAC (Site Code: 000432)
4. Bolingbrook Hill SAC (002124)
5. Clare Glen SAC (000930)
6. Curraghchase Woods SAC (000174)
7. Glenomra Wood SAC (001013)
8. Glenstal Wood SAC (001432)
9. Kilduff, Devilsbit Mountain SAC (000934)
10. Lough Derg (Shannon) SPA (004058)
11. Lough Derg, North-East Shore SAC (002241)
12. Philipston Marsh SAC (001847)
13. Ratty River Cave SAC (002316)
14. Silvermine Mountain SAC (000939)
15. Slieve Bernagh SAC (002312)
16. Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161)
17. Tory Hill SAC (000439)
18. Keeper Hill SAC (001197)
19. River Shannon and River Fergus Estuaries SPA (004077)
20. Silvermine Mountain West SAC (002258)

Therefore, these EU sites have been 'Screened Out' at Stage One of the Appropriate Assessment process. In accordance of the recommendations of the Guidance Document '*Assessment of Plans and Projects significantly affecting Natura 2000 Sites: Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive92/43/EEC'*, (European Commission 2001), a Finding of No Significant Effects (FONSE) Report has been completed in respect of same- and is included as Appendix A3.

With regard to the following listed EU Sites, Significant Effects, in the absence of environmental protection measures (which is not considered herein at Screening Stage) are considered possible or likely via identified source-pathway linkages:

1. Lower River Shannon SAC (002165)
2. Lower River Suir SAC (002137)
3. Slievefelim to Silvermines SPA (004077)

As a result, there is an obligation on the Competent Authority to carry out an Appropriate Assessment (i.e. Stage Two of the AA process) under Article 6 (3) of the Habitats Directive for this project, and in this context a Stage 2 Appropriate Assessment Report has been completed.

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5 STAGE 2 – APPROPRIATE ASSESSMENT REPORT

This section of the Natura Impact Statement comprises a detailed impact assessment of the implications of the plan or project, alone and in combination with other plans and projects, on the integrity of 3 European Sites in view of their respective conservation objectives, as identified in the Stage 1 Screening Report (Section 4.2.3).

These are as follows:

1. Lower River Shannon SAC (002165)
2. Lower River Suir SAC (002137)
3. Slievefelim to Silvermines SPA (004077)

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5.1 Elements likely to give rise to Significant Effects

Source Impact Pathways considered likely to give rise to Significant Effects and their associated European Site have been derived from the Screening exercise (Section 4.2.3), where relevant impact sources and pathways to specific qualifying interests and special conservation interests were evaluated and screened in for further examination on the basis of potential for significant effects. The pertinent Source Impact Pathways for the designated European Sites are summarised in Table 5.1. It is important to note that these are grouped by receptor and we refer the tables in Section 5.3.5 for the identified sources of specific effects.

Table 5.1: Source Impact Pathways Screened In at Stage1/ requiring evaluation at Stage 2

European Site Under Consideration	Qualifying Interest/Species of Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)[+] On QI/SCI	Applicable Whole UWF Project Elements- Screened In
Slievefelim to Silvermines SPA (004077)	Hen Harrier (*Circus cyaneus*)	Construction	Land Use Change	Land cover	Reduction in or Loss of suitable or potentially suitable Hen Harrier Foraging Habitat (alone or in combination)	UWF Grid Connection UWF Related Works.
Slievefelim to Silvermines SPA (004077)	Hen Harrier (*Circus cyaneus*)	Construction/ Operational Maintenance	Forestry Felling/ Operating Machinery	Contact	Inadvertent Mortality of Hen Harrier in or at Nest or Roost Sites (alone or in combination)	UWF Grid Connection UWF Related Works UWF Other Activities (Monitoring)
Slievefelim to Silvermines SPA (004077)	Hen Harrier (*Circus cyaneus*)	Construction/ Operation	Noise and human activity	Visibility	Disturbance/Displacement of Nesting/Roosting Hen Harrier (alone or in combination)	UWF Grid Connection UWF Related Works UWF Other Activities (Monitoring)
Slievefelim to Silvermines SPA (004077)	Hen Harrier (*Circus cyaneus*)	Construction	Land Use Change	In combination effects (from multiple developments/ agriculture / turbary / Forestry)	Reduction in or Loss of Suitable Hen Harrier Foraging Habitat	UWF Grid Connection UWF Related Works.

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European Site Under Consideration	Qualifying Interest/Species of Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Applicable Whole UWF Project Elements- Screened In
Lower River Shannon SAC (002165)	Floating river vegetation (3260)	Construction	Land Take Reinstatement Sediment Movement of Soils Instream Works Machinery Movement Excavation Works Dewatering of excavations Permanent Access Roads and Hardstanding Cement based materials Hydrocarbons Overburden Storage Groundworks Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)	Soils/ Surface Water Flowpaths/ Movement of Soils/ Surface Water	Riparian Habitat Degradation/ Spread of Aquatic Invasive Species/ Decrease in aquatic habitat quality via: surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ ground water quality impacts/ Changes in flow regime	UWF Grid Connection UWF Related Works.
Lower River Shannon SAC (002165)	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)	Construction	Landtake Movement of soils and machinery Instream Works Excavation Works Sediment Dewatering of excavations Permanent Access Roads and Hardstanding Use of Cement Based Compounds Hydrocarbons Overburden Storage Groundworks Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers) Reinstatement	Soils/ Surface Water and Ground Water Flowpaths/ Landcover/ Surface Water	Riparian Habitat Degradation/ Spread of Aquatic Invasive Species/ Decrease in aquatic habitat quality via: surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ ground water quality impacts/ Changes in flow regime	UWF Grid Connection UWF Related Works.
Lower River Shannon SAC (002165)	Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*) Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Construction	Land Take/ Reinstatement/ Sediment/Instream Works/Machinery Movement/ Excavation Works/ Dewatering of excavations/ Permanent Access Roads and Hardstanding/ Cement based materials/Drilling/ Noise and	Movement of Soils/ Surface Water and Groundwater Flowpaths/ Movement of Machinery/Landcover/ Surface Water/ Visibility/ Ground and Air Vibrations/	Riparian Habitat Degradation/ Disturbance to Fisheries/ Spread of Aquatic Invasive Species/ Decrease in habitat quality via: surface water runoff,	UWF Grid Connection UWF Related Works.

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European Site Under Consideration	Qualifying Interest/Species of Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Applicable Whole UWF Project Elements- Screened In
			Human Disturbance/Hydrocarbons/ Overburden Storage/ Groundworks/Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)	Direct Contact/ Nitrogen Deposition	sediment entrainment or release; release of fuels oils/ chemicals,surface/ground water quality impacts/ Changes in flow regime;	
Lower River Shannon SAC (002165)	Otter (*Lutra lutra*)	Construction	Land Take/ Reinstatement/ Sediment/Instream Works/Machinery Movement/ Excavation Works/ Movement of Soils/ Construction Noise and Vibration/ Dewatering of excavations/ Permanent Access Roads and Hardstanding/ Cement based materials/ Hydrocarbons/ Drilling/ Overburden Storage/ Groundworks/Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)	Soils/ Surface Water Flowpaths/ Landcover/ Movement of Soils and Machinery/ Surface Water/ Direct Contact/ Ground and Air Vibrations/	Riparian Habitat Degradation/ Disturbance to Fisheries/ Spread of Aquatic Invasive Species/ Decrease in habitat quality via: surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ground water quality impacts/ Changes in flow regime/ Disturbance to Otter	UWF Grid Connection UWF Related Works
Lower River Suir SAC (002137)	Floating river vegetation (3260)	Construction /Operation (maintenance and surface water runoff)	Land Take/ Reinstatement/ Sediment/ Movement of soils/ Instream Works/ Machinery Movement/ Excavation Works/ Dewatering of excavations/ Permanent Access Roads and Hardstanding/ Cement based materials/ Hydrocarbons/ Overburden Storage/ Groundworks	Soils/ Surface Water Flowpaths/ Movement of Soils/ Surface Water/Direct Contact	Riparian Habitat Degradation/ Spread of Aquatic Invasive Species/ Decrease in habitat quality via:sediment entrainment or release/or release of fuels oils and chemicals ,surface/ground water quality impacts/ Changes in flow regime	UWF Grid Connection UWF Related Works. UWF Other Activities
Lower River Suir SAC (002137)	Alluvial Forests* (91E0)	Construction	Movement of soils/ Instream Works/ Machinery Movement/	Surface Water	Spread of Aquatic Invasive Species	UWF Grid Connection UWF Related Works. UWF

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European Site Under Consideration	Qualifying Interest/Species of Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Applicable Whole UWF Project Elements- Screened In
Lower River Suir SAC (002137)	Freshwater Pearl Mussel	Construction /Operation (maintenance and surface water runoff)	Movement of soils Instream Works Machinery Movement Excavation Works/ Forestry Felling/Hydrocarbons/ Reinstatement/ Overburden Storage/Sediment/ Use of Cement Based Compounds/ Permanent Access Roads and Hardstanding /Dewatering of excavations	Soils/ Surface Water and GroundWater Flowpaths/ Landcover/Direct Contact	Riparian Habitat Degradation/ Decrease in habitat quality via: surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ground water quality impacts / Changes in flow regime/ Disturbance to/or displacement of Aquatic species/ Spread of Aquatic Invasive Species	UWF Grid Connection UWF Related Works. UWF Other Activities
Lower River Suir SAC (002137)	White-Clawed Crayfish Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyz-on marinus*) Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Construction /Operation (maintenance and surface water runoff)	Movement of soils/ Instream Works/ Machinery Movement/ Excavation Works/ Forestry Felling/Hydrocarbons/ Reinstatement/ Overburden Storage/Sediment/ Use of Cement Based Compounds/ Permanent Access Roads and Hardstanding /Dewatering of excavations	Soils/ Surface Water and GroundWater Flowpaths/ Landcover/Direct Contact	Riparian Habitat Degradation/ Decrease in habitat quality via: surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ground water quality impacts/ Changes in flow regime/ Disturbance to/or displacement of Aquatic species/ Spread of Aquatic Invasive Species	UWF Grid Connection UWF Related Works. UWF Other Activities

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European Site Under Consideration	Qualifying Interest/Species of Conservation Interest	Project Stage	Potential Source(s) of Impacts affecting European Sites (alone or in combination with other project elements, plans or projects)	Possible Exposure Pathway(s) to QI/SCI	Potential Effect(s)† On QI/SCI	Applicable Whole UWF Project Elements- Screened In
Lower River Suir SAC (002137)	Otter (*Lutra lutra*)	Construction /Operation (maintenance and surface water runoff)	Reinstatement/Sediment/ Movement of soils/ Instream Works/ Machinery Movement/ Instream Works/Excavation Works/Forestry Felling/Reinstatement Use of Cement Based Compounds	Landcover/ Surface Water Soils/Direct Contact Runoff and Surface Water Flowpaths	Changes in flow regime/ Riparian Habitat Degradation/ Decrease in habitat quality via: surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ground water quality impacts/ Spread of Aquatic Invasive Species	UWF Grid Connection UWF Related Works. UWF Other Activities

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5.2 The Conservation Objectives of the Natura 2000 Sites

The conservation objectives of the European Sites concerned are to maintain the favourable conservation status of the key species and habitats for which the sites have been designated. These are summarised in respect of the European Sites (and Qualifying Interests/Special Conservation Interests going forward for further evaluation) in Table 5.2, Table 5.3 and Table 5.4, below and provided in their entirety in respect of each European Site within Appendix A2 of this document.

Table 5.2 Conservation Objectives of Slievefelim to Silvermines Mountains SPA (004165)

Slievefelim to Silvermines Mountains SPA (004165)	
Hen Harrier (*Circus cyaneus*)	**To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:**

Sourced from NPWS (2016) *Conservation objectives for Slievefelim to Silvermines Mountains SPA [004165]. Generic Version 5.0*. Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Publication dated 15/08/2016; Accessed online on 07/11/2017]

Table 5.3 Conservation Objectives of the Lower River Shannon SAC (002165)

Lower River Shannon SAC (002165)			
Atlantic Salmon (Salmo salar) (only in freshwater)	**To restore the favourable conservation condition of Salmon in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas. The large hydro-electric station at Ardnacrusha and the Parteen regulating weir present considerable obstructions to upstream passage of salmon on the Shannon main channel. While both have fish passes installed, upstream migration of salmon is still problematical. Further weirs upstream on the Shannon also restrict access to spawning habitat. No such obstacles, causing significant fish passage issues for salmon are present on the Feale and Mulkear rivers
Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded	A conservation limit is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee of the National Salmon Commission's annual model output of CL attainment levels. See SSC (2010). Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The salmon stocks in the Shannon above the impoundments are significantly below their Conservation Limits. Salmon stocks in the Feale and Mulkear rivers are above CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling	Target is threshold value for rivers currently exceeding their conservation limit (CL). The abundance of salmon fry at monitored sites on the Shannon main channel, above the hydro-electric station, is significantly below this target
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*). On the Shannon main channel, salmon smolt abundance may be significantly

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Lower River Shannon SAC (002165)			
			affected by mortality passing through hydro- electric turbines
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels. Artificial barriers are currently preventing salmon from accessing suitable spawning habitat on the Shannon main channel
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)
Floating river vegetation (3260)	**To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	Three sub-types of high conservation value are known to occur in the site. See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details. Note: rooted macrophytes should be absent or trace (< 5% cover) in freshwater pearl mussel (*Margaritifera margaritifera*) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat 3260 in the Cloon River within this SAC, because the mussel requires environmental conditions closer to natural background levels
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 13	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Hydrological regime: tidal influence	Daily water level fluctuations - metres	Maintain natural tidal regime	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Hydrological regime: freshwater seepages	Metres per second	Maintain appropriate freshwater seepage regimes	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Substratum composition: particle size range	Millimetres	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles)	Although many of the high-conservation- value sub-types are dominated by coarse substrata, for certain sub-types, notably triangular club-rush (*Schoenoplectus triqueter*) and opposite-leaved pondweed (*Groenlandia densa*), fine substrata are required. See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Water quality: nutrients	Milligrams per litre	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition	The specific targets may vary among sub- types. See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Vegetation composition: typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Floodplain connectivity	Area	The area of active floodplain at and upstream of the habitat should be maintained	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Riparian habitat	Area	The area of riparian woodland at and upstream	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details. See

Lower River Shannon SAC (002165)			
		of the bryophyte-rich sub-type should be maintained	also the conservation objective for Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (91E0)
Otter (*Lutra lutra*)	**To restore the favourable conservation condition of Otter in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in Shannon catchment estimated at 70.5% (Bailey and Rochford 2006)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 596.8ha above high water mark (HWM); 958.9ha along river banks/ around ponds	No field surveys. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 4,461.6ha	No field surveys. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 500.1km	No field surveys. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake/lagoon) habitat	Hectares	No significant decline. Area mapped and calculated as 125.6ha	No field surveys. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006) and wrasse and rockling in coastal waters (Kingston *et al.*, 1999)
Barriers to connectivity	Number	No significant increase. For guidance, see map 17	Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed
Sea Lamprey (*Petromyzon marinus*)	**To restore the favourable conservation condition of Sea Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas. See Gargan *et al.* (2011). Specific barriers serve to constrain the up- river migration of sea lamprey. The upper extent of the SAC in the R. Fergus is delineated by a barrier to migration. Barriers are also present in the Mulkear and Feale
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007)
Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003)
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Lampreys spawn in clean gravels. Surveys by Inland Fisheries Ireland (IFI) commonly indicated accumulations of redds downstream of major weirs. (See also Gargan *et al.*, 2011)
Availability of juvenile habitat	Number of positive sites in 3rd order	More than 50% of sample sites positive	Despite observed spawning activity, sampling for ammocoetes consistently fails to find these in many sampling stations and never in any great numbers

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Lower River Shannon SAC (002165)			
	channels (and greater), downstream of spawning areas		
Brook Lamprey (*Lampetra planeri*)	**To maintain the favourable conservation condition of Brook Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to brook lampreys' migration, both up- and downstream, thereby possibly limiting the species to specific stretches and creating genetically isolated populations (Espanhol *et al.*, 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	Attribute and target based on data from Harvey and Cowx (2003). It is impossible to distinguish between brook and river lamprey juveniles in the field (Gardiner, 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Spawning site and redd attributes established by IFI (Rooney *et al.*, in press)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date (King *et al.*, unpublished data)
River Lamprey (*Lampetra fluviatilis*)	**To maintain the favourable conservation condition of River Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to river lampreys' migration, both up- and downstream, thereby possibly limiting species to specific stretches and creating genetically isolated populations (Espanhol *et al.*, 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present	Attribute and target based on data from Harvey and Cowx (2003). It is impossible to distinguish between river and brook lamprey juveniles in the field (Gardiner 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of river/brook lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date (King *et al.*, unpublished data)

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Lower River Shannon SAC (002165)			
Alluvial Forests* (91E0)	**To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least c.8.5ha for sites surveyed. See map 14	Minimum area, based on 5 sites surveyed by Perrin *et al.* (2008) - site codes 1286, 1577, 1857, 1861, 1995. See woodland habitats supporting document for further details. NB further areas are likely to be present within the SAC
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 14	Distribution based on Perrin *et al.* (2008). NB further areas are likely to be present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). Topographical and land-ownership constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; sub canopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin *et al.* (2008). See woodland habitats supporting document for further details
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin *et al.* (2008). See woodland habitats supporting document for further details
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Alder and oak regenerate poorly. Ash often regenerates in large numbers although few seedlings reach pole size
Hydrological regime: flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river floodplains
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least 30m^3/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local distinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-data and other rare or localised species. Perrin and Daly (2010) list four sites as containing potential ancient/long established woodland. See woodland habitats supporting document for further details
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin *et al.* (2008)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including	Species reported in Perrin *et al.* (2008). See woodland habitats supporting document for further details

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Lower River Shannon SAC (002165)			
		alder (*Alnus glutinosa*), willows (*Salix* spp) and, locally, oak (*Quercus robur*) and ash (*Fraxinus excelsior*)	
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The following are the most common invasive species in this woodland type: Himalayan balsam (*Impatiens glandulifera*), giant hogweed (*Heracleum mantegazzianum*), sycamore (*Acer pseudoplatanus*)

Sourced from NPWS (2012) *Conservation Objectives: Lower River Shannon SAC 002165. Version 1.0*. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht. [Publication dated 07/08/2012; Accessed online on 07/11/2017]

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Table 5.4 Conservation Objectives of the Lower River Suir SAC (002137)

Lower River Suir SAC (002137)			
Floating River Vegetation (3260)	**To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in Lower River Suir SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	The description of habitat 3260 covers upland rivers with bryophytes and macroalgae to lowland depositing rivers with pondweeds and starworts. The selection of Lower River Suir SAC used this broad interpretation. Conservation objectives for habitat 3260 concentrates on the high conservation value sub-types, however, little is known of the habitat's distribution or its sub-types in Lower River Suir SAC. There is a large number of lowland and tidal rivers in the SAC, as well as faster-flowing tributaries. Note: rooted macrophytes should be absent or trace (<5% cover) in freshwater pearl mussel (*Margaritifera margaritifera*) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat 3260 in the Clodiagh River (Portlaw) within this SAC, because the mussel requires environmental conditions close to natural background levels
Habitat distribution	Occurrence	No decline, subject to natural processes	Further study is needed of Irish sub-types and their conservation value to interpret the broad description of habitat 3260 (European Commission, 2013). As noted above, little is known about the distribution of the habitat and its sub-types in Lower River Suir SAC. The uncommon, protected opposite-leaved pondweed (*Groenlandia densa*) was recorded in the SAC from floodplain ditches of the Suir near Carrickon-Suir and Clonmel, as well as the Clodiagh near Portlaw (Colgan and Scully, 1898; NPWS internal files). See NPWS (2012) for information on the requirements of opposite-leaved pondweed. There are no known records for rare or threatened bryophytes from the rivers in the SAC (Lockhart *et al.*, 2012). The rivers in the SAC are mainly lowland, depositing and tidal, and are likely dominated by marginal and submerged higher plants. Some fast-flowing rivers also occur that should, naturally, be dominated by macroalgae and bryophytes, with limited submerged or emergent higher plants
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	High conservation value sub-types are associated with natural hydrology. A natural flow regime is required for both plant communities and channel geomorphology to be in favourable condition, exhibiting typical dynamics for the river type (Hatton-Ellis and Grieve, 2003). For many sub-types, high flows are required to maintain the substratum necessary for the characteristic species. Flow variation can be particularly important, with high and flood flows being critical to the hydromorphology. Other aspects of hydrology, such as tidal regime, are important for certain sub-types of the habitat. The rivers in the SAC vary from naturally flashy, through depositing to tidal reaches
Hydrological regime: groundwater discharge	Metres per second	Maintain appropriate hydrological regime	Even small groundwater contributions can significantly alter hydrochemistry, particularly where there is basic bedrock and/or subsoils. Freshwater seepages can be very important in tidal reaches
Hydrological regime: tidal influence	Daily water level fluctuations - metres	Maintain natural tidal regime	Opposite-leaved pondweed (*Groenlandia densa*) is typical of the tidal reaches of large Irish rivers, e.g. Suir, Slaney, Shannon and Blackwater (see Preston and Croft, 2001; Preston, 2003). This species is listed as Near Threatened (Wyse Jackson *et al.*, 2016) and is protected on the Flora (Protection) Order, 2015 (Statutory Instrument No. 356 of 2015). Both the disturbance and substratum associated with the tidal regime may be important drivers
Substratum composition: particle size range	Millimetres	Maintain appropriate substratum particle size range, quantity	Many of the high conservation value sub-types are dominated by coarse substrata, and it is likely that bedrock, boulders, cobbles and coarse gravels were naturally abundant in many tributaries in this SAC, particularly where the freshwater pearl mussel (*Margaritifera*

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Lower River Suir SAC (002137)			
		and quality, subject to natural processes	*margaritifera*) occurred. Fine substrata are naturally abundant in depositing and tidal reaches. The size and distribution of particles are largely determined by the river flow. The chemical composition (particularly minerals and nutrients) of the substratum is also important. The quality of finer sediment particles is a notable driver of rooted plant communities. Note: increased fine sediment is contributing to the unfavourable status of the freshwater pearl mussel in the Clodiagh. See the freshwater pearl mussel (1029) conservation objective
Water quality	Various	Maintain appropriate water quality to support the natural structure and functioning of the habitat	The specific targets may vary among sub-types. Depositing and tidal stretches of rivers may, naturally, be more nutrient-rich and, therefore Water Framework Directive (WFD) good status may suffice in terms of nutrient and oxygenation standards, and EQRs (Ecological Quality Ratios) for macroinvertebrates and phytobenthos. Faster flowing tributaries that are naturally dominated by bryophytes and macroalgae typically require WFD high status. High status targets apply to freshwater pearl mussel (Margaritifera margaritifera) habitat in the Clodiagh (see The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 - S.I. No. 296 of 2009). See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009), Environmental Protection Agency (EPA) river water quality reports (e.g. Bradley *et al.*, 2015) and Ní Chatháin *et al.* (2013)
Typical species	Occurrence	Maintain typical species in good condition, including appropriate distribution and abundance	The sub-types of this habitat are poorly understood and their typical species have not yet been fully defined. The typical species may include higher plants, bryophytes, macroalgae and microalgae, and invertebrates. As noted above, the protected vascular plant species opposite-leaved pondweed (*Groenlandia densa*) is associated with rivers and floodplains in the SAC. The banks of the Suir, particularly its tidal stretches, support a notable population of the rare *Rumex crispus subsp. uliginosus* (Green, 2008)
Floodplain connectivity	Hectares	Maintain floodplain connectivity necessary to support the typical species and vegetation composition of the habitat	River connectivity with the floodplain is important for the functioning of this habitat. Channels with a naturally functioning floodplain are better able to maintain habitat and water quality (Hatton-Ellis and Grieve, 2003). Floodplain connectivity is particularly important in terms of sediment sorting and nutrient deposition. High conservation value rivers are intimately connected to floodplain habitats and function as important wildlife corridors, connecting otherwise isolated or fragmented habitats in the wider countryside (Hatton-Ellis and Grieve, 2003; Mainstone *et al.*, 2016). Alluvial woodland (91E0) is an important feature of rivers in Lower River Suir SAC (see the conservation objective for 91E0)
Fringing habitats Hectares	Hectares	Maintain marginal fringing habitats that support the typical species and vegetation composition of the habitat	Riparian habitats (including those along lake shores), particularly natural/semi-natural woodlands and wetlands, are an integral part of the structure and functioning of river systems, even where they do not form part of a natural floodplain. Fringing habitats can contribute to the aquatic food web (e.g. allochthonous matter such as leaf fall), provide habitat (refuge and resources) for certain life-stages of fish, birds and aquatic invertebrates, assist in the settlement of fine suspended material, protect banks from erosion and contribute to nutrient cycling. Shade may also be important in suppressing algal growth in enriched rivers and moderating temperatures. Equally, fringing habitats are dependent on rivers/lakes, particularly their water levels, and support wetland communities and species of conservation concern. See Mainstone *et al.* (2016). Alluvial and riparian woodland is important for the rivers in Lower River Suir SAC
Alluvial Forests* (91E0)	**To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) in the Lower River Suir SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Habitat area	Hectares	Area stable or increasing, subject to	Alluvial forest was surveyed in Lower River Suir SAC by Perrin et al. (2008) as part of the National Survey

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Lower River Suir SAC (002137)			
		natural processes, at least c.32.9ha for sites surveyed. See map 5	of Native Woodlands (NSNW) at Fiddown (NSNW site code: 0022), Mountbolton (NSNW site code: 1823) and Ballycanvan Big (NSNW site code: 1839). Fiddown (0022) was also included in a national monitoring survey (O'Neill and Barron, 2013). The area of alluvial woodlands in the surveyed sites within the SAC is estimated to be 32.9ha. It is important to note that further unsurveyed areas of alluvial forest are present within the SAC, for example at islands below Carrick-on-Suir, at Shanbally (Coillte LIFE project site), Tibberaghny Marshes, along the lower stretches of the more westerly of the Suir tributaries and along both banks of the Suir as far east as the Dawn River (NPWS internal files). Map 5 shows the alluvial woodlands surveyed by Perrin et al. (2008)
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 5	Distribution based on Perrin *et al.* (2008). NB further areas are likely to be present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The target areas for individual woodlands aim to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). In some cases, topographical constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; sub canopy layer with semi- mature trees and shrubs; and well-developed herb layer	Described in Perrin *et al.* (2008) and NPWS internal files
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin *et al.* (2008) and NPWS internal files
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Alder (Alnus glutinosa) and oak (Quercus spp.) tend to regenerate poorly. Ash (Fraxinus excelsior) often regenerates in large numbers although few seedlings reach pole size
Hydrological regime: flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river floodplains, but not for woodland around springs/seepage areas
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least 30m^3/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-listed and other rare or localised

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local distinctiveness			species. Perrin and Daly (2010) identify the site Ballycanvan Big (NSNW site code: 1839) as being "possible ancient woodland"
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin *et al.* (2008) and NPWS internal files
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including alder (*Alnus glutinosa*), willows (*Salix* spp), oak (*Quercus robur*), ash (*Fraxinus excelsior*) and birch (*Betula pubescens*)	Species reported in Perrin *et al.* (2008) and NPWS internal files
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	Norway spruce (*Picea abies*) and sycamore (*Acer pseudoplatanus*) occur at Shanbally (NPWS internal files). Spread of Japanese knotweed (*Fallopia japonica*) is a problem at Tibberaghny (NPWS internal files). Cherry laurel (*Prunus laurocerasus*) and rhododendron (*Rhododendron ponticum*) have been reported as occurring in part of Ballycanvan Big (NSNW site code: 1839) by Perrin et al. (2008), but not within the alluvial woodland.
Freshwater Pearl Mussel (*Margaritifera margaritifera*)	**To restore the favourable conservation condition of Freshwater Pearl Mussel in Lower River Suir SAC, which is defined by the following list of attributes and targets:**		
Attribute	Measure	Target	Notes
Distribution	Kilometres	Restore distribution to 10.4km. See map 6	The conservation objective applies to the Clodiagh freshwater pearl mussel (*Margaritifera margaritifera*) population, which is listed on The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. (S.I. 296 of 2009). Full baseline distribution and abundance mapping was conducted in 2006 (Ross, 2006). Mussel habitat is widespread in the Clodiagh, with mussels almost continually present in low numbers from downstream of Clonea to above Portlaw (Ross, 2006). Mussels were nowhere abundant; maximum density was 3 per square metre (Ross, 2006). The habitat is significantly below carrying-capacity. The distribution in the Clodiagh has contracted since the 1990s (Ross, 2006). The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Clodiagh system. See NPWS (2010) for further information
Population size	Number of adult mussels	Restore population to at least 10,000 adult mussels	Ross (2006) counted 1,206 mussels and estimated a total population of 2,412, concluding that, given the large areas of physically suitable habitat, a much larger population was previously present and a major population decline had occurred. Ross (2009) measured an 18.5% decline in mussel numbers between 2006 and 2009 at transect 1, indicating continued losses. Ross *et al.* (2017) recorded 'rapid and alarming' declines of 56-94% between 2006 and 2016 at five monitoring locations (67% decline overall). Moorkens (2010) estimated the population to be less than 10,000. The target of 10,000 is considered appropriate for a functional, self-sustaining population. NPWS (2013), in producing a national population estimate, assumed the Clodiagh population had declined at a rate of 3% per year. The target is for the species to be sufficiently abundant to maintain itself on a long-term basis as a viable component of the Clodiagh system
Population structure: recruitment	Percentage per size class	Restore to at least 20% of each population no more than 65mm in length; and at least 5% of	Mussels ≤65mm are 'young mussels' and found buried in the substratum or beneath adult mussels. Mussels ≤30mm are 'juvenile mussels' and always buried in the substratum. See the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The Clodiagh failed both targets in 2006, 2009

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		each population no more than 30mm in length	and 2016 (Ross, 2006, 2009; NPWS, 2010; Ross *et al.*, 2017). Ross (2006) found no juveniles, ≤65mm extremely uncommon, smallest individual was 45.4mm and 97% was >80mm. In 2009, the smallest mussel was 78mm and (based on Ross, 1988) 15-20 years old (Ross, 2009). The smallest of 21 mussels measured in 1986 was 48.6mm (Ross, 1988). NPWS (2010) concluded there had been no successful recruitment from 1986 to 2009. The Clodiagh population is considered to be unsustainable owing to lack of survival of juvenile and adult mussels. The target is for sufficient juvenile recruitment to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses. The Clodiagh failed both targets in 2009 (Ross, 2009; NPWS, 2010) and, as noted above, a major population decline has occurred (Ross, 2006; Ross *et al.*, 2017), and is presumed to be on-going. In 2009, 1 transect and 1 delimited count were counted: T1 numbers had fallen from 27 in 2006 to 22, representing a 18.5% decline, while numbers were the same in C2. Seven dead shells were found among 23 live mussels at one location, indicating high mortality in parts of the Clodiagh. In 2016, 67 mussels were counted at five monitoring sites that had 205 mussels in 2006 (Ross *et al.*, 2017). The target is for sufficient survival of adults to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system.
Suitable habitat: extent	Kilometres	Restore suitable habitat in more than 8.8km in the Clodiagh system and any additional stretches necessary for salmonid spawning	Mussel habitat in the Clodiagh is known to occur from Clonea to Portlaw, and is sparsely occupied from c.630m downstream of Clonea to c.1.8km above Portlaw (Ross, 2006). Mussels were recorded at Portlaw as recently as the 1990s and downstream of Portlaw in the early 20th century. It is possible that some mussel habitat occurs upstream or downstream of the mapped stretches, but few mussels are likely to be found (Ross, 2006). The mussel habitat has been severely impacted for a significant period by sedimentation, other hydromorphological changes, organic pollution and eutrophication (NPWS, 2010). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system
Suitable habitat: condition	Kilometres	Restore condition of suitable habitat	The species' habitat is a combination of the area of 1) habitat adult and juvenile mussels can occupy; 2) spawning and nursery habitats host fish can occupy. Fish nursery and mussel habitat typically overlap. Fish spawning habitat is generally adjacent to mussel habitat but may lie upstream of the generalised mussel distribution. Only spawning areas that regularly contribute juvenile fish to adult mussel habitat should be considered. Availability of mussel and fish habitat is determined by flow and substratum conditions. It is highly sensitive to hydromorphological changes, sedimentation and enrichment. Pressures throughout the catchment contribute to such impacts. Mussel habitat is widespread in the Clodiagh but in unfavourable condition owing to sedimentation, other hydromorphological changes and nutrient enrichment. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system.
Water quality: Macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality - macroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93	The EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). In 2009, the habitat in the Clodiagh system failed the macroinvertebrate target, but passed the phytobenthos target (Morgan, 2009; Ní Chatháin, 2010; NPWS, 2010). Q values in the mussel habitat were Q3-Q4 (Morgan, 2009). There has been a gradual decline in quality at several main-channel sites since the late 1970s (Morgan, 2009). Sewage discharge at Clonea is impacting

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			water quality downstream of Clonea Bridge (Ross, 2006; Morgan, 2009; Ní Chatháin, 2010; NPWS, 2010). See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system
Substratum quality: filamentous algae (macroalgae); macrophytes (rooted higher plants)	Percentage	Restore substratum quality - filamentous algae: absent or trace (less than 5%); macrophytes: absent or trace (less than 5%)	The Clodiagh failed the macrophyte target, but marginally passed the macroalgal target in 2009 (NPWS, 2010). Patches of abundant *Ranunculus* were recorded by all surveyors, with up to 40% cover in places (Morgan, 2009; Ross, 2009; Ní Chatháin, 2010; NPWS, 2010). Ross (2006) also recorded widespread and, in places, abundant (up to 80%) *Ranunculus*. Algae were generally absent in 2009, however up to 10% Cladophora cover was recorded downstream of Clonea Bridge (Ní Chatháin, 2010; NPWS, 2010), where sewage fungus had previously been recorded (Ross, 2006). Algae were also sparse in 2006 and 2016 (Ross, 2006; Ross *et al.*, 2017). Tree shade may be supressing plant growth over much of the mussel habitat (Ross *et al.*, 2017). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system.
Substratum quality: sediment	Occurrence	Restore substratum quality - stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The Clodiagh failed the target for the Sub-basin Management Plan in 2009 and 2016, with strong silt plumes recorded in mussel habitat (Ross, 2009; NPWS, 2010; Ross *et al.*, 2017). Ross *et al.* (2017) recorded extremely heavy silt plumes at every site, even in fast riffles. Ross (2006) recorded significant siltation of the mussel habitat and observed river bank erosion and collapse, and livestock entry to the river. Silt in the Clodiagh is providing a rooting medium for macrophytes. Sufficient survival of juvenile and adult mussels is being prevented by the poor condition of the river substratum. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. Average redox was very poor, 23-28% at four sites monitored in 2016, only three of the 40 measurements was <20% (Ross *et al.*, 2017). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system
Hydrological regime: flow variability	Metres per second	Maintain appropriate hydrological regime	The availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other key factor). To restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum; 2) high flows are not artificially increased so as to cause excessive scour of mussel habitat; 3) low flows do not exacerbate the deposition of fine sediment or growth of Zlgae/macrophytes and 4) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle; see Moorkens and Killeen (2014). Groundwater inflow to the substratum contributes to water-cycling. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of Clodiagh system.
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval stage of the freshwater pearl mussel and essential to completion of the life cycle. 0+ and 1+ fish are typically used, both because of habitat overlaps and the development of immunity with age in fish. Fish presence is sufficient, as higher fish density and biomass is indicative of enriched conditions in mussel rivers. Geist *et al.* (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for mussels and a lack of mussel recruitment, while

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			significantly lower host fish density and biomass were associated with high juvenile mussel numbers. Fish movements must be such that 0+ fish remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time. No glochidia were found on young Clodiagh fish in May 2009, although six trout and 38 salmon were caught (Johnston, 2009; NPWS, 2010).
Fringing habitat: area and condition	Hectares	Restore the area and condition of fringing habitats necessary to support the population	Riparian habitats, including those along lake fringes, particularly natural/semi-natural woodlands and wetlands, even where they do not form part of a natural floodplain, are an integral part of the structure and functioning of river systems. Fringing habitats aid in the settlement of fine suspended matter, protect banks from erosion, contribute to nutrient cycling and to the aquatic food web (e.g. allochthonous matter such as leaf fall) and provide habitat for life-stages of fish, birds and aquatic invertebrates. Shade may also be important in suppressing algal and macrophyte growth in enriched rivers (e.g. along parts of the Clodiagh) and moderating temperatures. Equally, fringing habitats are dependent on rivers/lakes, particularly their water levels, and support wetland communities and species of conservation concern. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system
White-clawed Crayfish (*Austropotamobius pallipes*)	**To maintain the favourable conservation condition of White-clawed Crayfish in Lower River Suir SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Distribution	Occurrence	No reduction from baseline. See map 7	White-clawed crayfish (*Austropotamobius pallipes*) occurs extensively on the River Suir and on many of its tributaries. On the River Suir main channel, the species has been recorded on almost the entire length of non-tidal river from the most upstream point at Cabragh, near Thurles, to downstream of Kilsheelan. It is also present on the following tributaries: Anner and lashawley, Clodiagh and Owenbeg, Multeen, Tar, Nier, and Clodiagh Lower
Population structure: recruitment	Occurrence of juveniles and females with eggs	Juveniles and/or females with eggs in all occupied tributaries	See Reynolds *et al.* (2010) for further details
Negative indicator species	Occurrence	No alien crayfish species	Alien crayfish species are identified as a major direct threat to this species and as a disease vector. Ireland is currently free of non-native invasive crayfish species. See Reynolds (1998) for further details
Disease	Occurrence	No instances of disease	Disease is identified as a major threat and crayfish plague has occurred in Ireland even in the absence of alien vectors. Disease can, in some circumstances, be introduced through contaminated equipment and water in the absence of vector species. See Reynolds (1998) for further details
Water quality	EPA Q value	At least Q3-4 at all sites sampled by EPA	Target taken from Demers and Reynolds (2002). Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)
Habitat quality: heterogeneity	Occurrence of positive habitat features	No reduction in habitat heterogeneity or habitat quality	Crayfish need high habitat heterogeneity. Larger crayfish must have stones to hide under, or an earthen bank in which to burrow. Hatchlings shelter in vegetation, gravel and among fine tree roots. Smaller crayfish are typically found among weed and debris in shallow water. Larger juveniles in particular may also be found among cobbles and detritus, such as leaf litter. These conditions must be available on the whole length of occupied habitat

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Sea Lamprey (*Petromyzon marinus*)	**To restore the favourable conservation condition of Sea Lamprey in Lower River Suir SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Distribution: extent of anadromy	Percentage of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas (Gargan *et al.*, 2011; Rooney *et al.*, 2015). Float-over surveys by Inland Fisheries Ireland (IFI) point to little success of sea lamprey adults in passing the weirs in Clonmel in Lower River Suir SAC. Modifications to these weirs would facilitate upstream passage of sea lamprey. IFI has embarked on a programme of detailed survey of major barriers in SAC catchments, in the context of sea lamprey passage, using the SNIFFER (Scotland and Northern Ireland Forum for Environmental Research) WFDIII methodology
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007). A catchment wide larval lamprey survey was completed by IFI in 2016. The data are currently being analysed
Juvenile density in fine sediment	Juveniles/ m^2	Juvenile density at least $1/m^2$	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003). A catchment-wide larval lamprey survey was completed by IFI in 2016. The data are currently being analysed
Extent and distribution of spawning habitat	m^2 and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by IFI. Lampreys spawn in clean gravels. Substantial areas of suitable spawning habitat are available from Cahir to Carrick-on-Suir, but access to areas upstream of Clonmel is problematic
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Silting habitat is essential for larval lamprey and they can be severely impacted by sediment removal. Recovery can be rapid and newly-created habitat can be rapidly colonised (King *et al.*, 2015). However, it is vital that such sedimenting habitats are retained
Brook Lamprey (Lampetra planeri)	**To restore the favourable conservation condition of Brook Lamprey in Lower River Suir SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Distribution	Percentage of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to lampreys' migration both up- and downstream, thereby possibly limiting species to specific stretches, restricting access to spawning areas and creating genetically isolated populations (Espanhol *et al.*, 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007). It is impossible to distinguish between brook and river lamprey juveniles in the field (Gardiner, 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/ m^2	Mean catchment juvenile density of brook/river lamprey at least $2/m^2$	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state $10/m^2$ in optimal conditions and more than $2/m^2$ on a catchment basis. A catchment-wide larval lamprey survey was completed by Inland Fisheries Ireland (IFI) in 2016. The data are currently being analysed
Extent and distribution of spawning habitat	m^2 and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by IFI. Brook lampreys spawn in clean gravels where they excavate shallow nests and can spawn communally (Rooney *et al.*, 2013)

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Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Silting habitat is essential for larval lamprey and they can be severely impacted by sediment removal. Recovery can be rapid and newly-created habitat can be rapidly colonised (King *et al.*, 2015). However, it is vital that such sedimenting habitats are retained
River Lamprey (*Lampetra fluviatilis*)	**To restore the favourable conservation condition of River Lamprey in Lower River Suir SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Distribution	Percentage of river accessible	Access to all water courses down to first order streams	Artificial barriers can block river lampreys' migration both up- and downstream, thereby limiting species to specific stretches, restricting access to spawning areas and creating genetically isolated populations (Espanhol *et al.*, 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007). It is impossible to distinguish between river and brook lamprey juveniles in the field (Gardiner, 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/ m^2	Mean catchment juvenile density of brook/river lamprey at least 2/m^2	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m^2 in optimal conditions and more than 2/m^2 on a catchment basis. A catchment-wide larval lamprey survey was completed by Inland Fisheries Ireland (IFI) in 2016. The data are currently being analysed
Extent and distribution of spawning habitat	m^2 and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). River lampreys spawn in clean gravels where they excavate shallow nests and can spawn communally in numbers (Rooney *et al.*, 2013)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Silting habitat is essential for larval lamprey and they can be severely impacted by sediment removal. Recovery can be rapid and newly-created habitat can be rapidly colonised (King *et al.*, 2015). However, it is vital that such sedimenting habitats are retained
Salmon (*Salmo salar*)	**To restore the favourable conservation condition of Atlantic Salmon in Lower River Suir SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Distribution: extent of anadromy	Percentage of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded	A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship".

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			The target is based on the Standing Scientific Committee on Salmon (SSCS) annual model output of CL attainment levels. See SSCS (2016). Attainment of CL estimates are derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The Suir is currently below CL, meeting 79% of CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	The target is the threshold value for rivers currently exceeding their conservation limit (CL). The average electrofishing value for the Suir in 2016 was 10.2 salmon fry, which is below the 17 fry target
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*)
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels. Artificial barriers are generally not currently preventing salmon from accessing suitable spawning habitat in Lower River Suir SAC
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)
Otter (*Lutra lutra*)	**To maintain the favourable conservation condition of Otter in Lower River Suir SAC, which is defined by the following list of attributes and targets:**		
Attribute	**Measure**	**Target**	**Notes**
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. Favourable Conservation Status (FCS) target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid *et al.* 2013)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 116.17ha above high water mark (HWM) and 726.61ha along river banks	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 712.27ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (Kruuk, 2006; NPWS, 2007)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 382.31km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk and Moorhouse, 1991; Kruuk, 2006)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid *et al.*, 2013) and wrasse and rockling in coastal waters (Kingston *et al.*, 1999)
Barriers to connectivity	Number	No significant increase	Otters will regularly commute across stretches of open water up to 500m e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed

Sourced from NPWS (2017) *Conservation Objectives: Lower River Suir SAC 002137. Version 1*. National Parks and Wildlife Service, Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs. [Publication dated 28/03/2017; Accessed online on 07/11/2017]

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5.3 Potential Impacts on Key Species and Habitats

The Whole UWF Project, and the respective Project Elements - UWF Grid Connection (Element 1), UWF Related Works (Element 2), Upperchurch Windfarm (Element 4) and UWF Other Activites (Element 5) have the potential to affect key species and habitats through various source pathway linkages as established. UWF Replacement Forestry (Element 3) has been screened out as a source of effects.

Potential Impacts are described in Table 5.1.

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5.3.1 Consideration of Project Design Measures

The following protective measures (Project Design Measures) which have been devised to prevent environmental effects on key Biodiversity receptors, are herein presented for the first time within the context of the evaluation of likely significant effects on European Sites. Measures which have been derived from the outset to avoid the likelihood of significant effects on European Sites are titled relative to the European Site in question in the following tables.

The Project Design Measures listed in Sections 5.3.1.1 to 5.3.1.5 are considered relevant to European Sites based on the source impact pathways identified at Stage 1.

Adherence to these measures will be a contractual obligation on appointed contractors. The implementation of all Biodiversity related measures will be monitored by the appointed Project Ecologist.

5.3.1.1 Environmental Protection Measures as part of the UWF Grid Connection design

The following protective measures (Project Design Measures) have been developed for UWF Grid Connection by the authors of this NIS along with the authors of the EIAR Water chapter (Hydro Environmental Services). These Project Design Measures are listed below and are included in the Description of UWF Grid Connection (A4) and in the UWF Grid Connection Environmental Management Plan (A9).

PD ID	UWF Grid Connection Project Design (PD) Environmental Protection Measure
PD01	All construction works will be carried out during daylight hours.
PD02	Flag-men will be used at temporary site entrances rather than creating sightlines by the removal of roadside boundaries. These flagmen will control the movement of traffic on the public road, so that road users can continue to use the local road network in a in a safe and efficient manner.
PD05	Land reinstatement will not be carried out during very wet weather or when the soil is waterlogged.
PD06	If any compaction has occurred along the construction works area, these areas will be ploughed with a sub-soiler to loosen the subsoil layer
PD07	Construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted
PD09	New permanent access roads will have a permanent surface water drainage network in place which will include check dams. These check dams will settle suspended solids in water runoff while also slowing down the rate of water run-off from these areas.
PD10	Only precast concrete culverts or structures will be used at watercourse crossing locations. No batching of wet cement will take place on-site.
PD11	Instream construction works will be followed by site-specific reinstatement measures to ensure the restoration of flow character and morphology within the affected reach. Measures will include: bank stabilisation using boulder armour or willow/brush bank protection; reinstatement of bank slope and character, creation of compound channels where necessary; reinstatement of instream flow features such as boulder substrates, pool / riffle sequences, or spawning cobbles; and planting along the riparian margin to stabilise banks, add flood protection and provide riparian buffer.
PD12	A phased approach will be undertaken in relation to watercourse crossing works, earthworks, forestry felling and excavation dewatering, where these works occur within 50m of a Class 1 or Class 2 watercourse. The phased approach will only permit one of main potential sediment producing activities, listed above, to be carried out within 50m of a Class 1 or Class 2 watercourse, at any one time.
PD13	All excavated material will be removed for temporary or permanent storage at a suitable location more than 50m away from all other Class 1 and Class 2 watercourses.
PD14	Temporary silt control methods such as silt fencing or containment berms will be placed around all overburden storage areas.

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PD ID	UWF Grid Connection Project Design (PD) Environmental Protection Measure
PD15	Permanent overburden storage berms will be graded and seeded immediately after emplacement.
PD16	For works within 50m of a Class 1 or Class 2 watercourse, additional mitigation measures include double silt fencing, temporary drain blocking, placement of straw bale arrangements along preferential surface water flowpaths and, where necessary, the use of matting to prevent ground erosion and rutting.
PD17	Where dewatering of trenches or excavations is required, there will be no direct discharge of treated water into any watercourse or drain. Rather all pumped water will be treated prior to discharge using an infiltration trench or settlement pond or suitable water treatment train such as a Siltbuster, as appropriate.
PD18	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse
PD19	The main fuel stocks for, and chemical wastes arising from, construction activities will be stored in a designated location, away from main traffic activity, within the temporary compound. All fuel will be stored in bunded, locked storage containers.
PD20	Overnight parking of plant and machinery will only be permitted at locations which are greater than 50m from watercourses and where there is an existing hard-core surface in place.
PD21	No refuelling of plant or equipment will be permitted within 100m of identified wells
PD22	In-stream works at Class 1 and Class 2 watercourses will only be undertaken during the IFI specified period (July, August and September) and will be carried out to best practice (IFI, 2016).
PD23	In-stream works will not be undertaken without isolation of flow within the watercourse, any fish within the isolated section will be removed using electrofishing and, following collection of biometrics, transferred immediately downstream of the crossing point and placed back in the water. The water will then be isolated from the works by over pumping, flume (pipe) or channel diversion methods.
PD24	All new permanent watercourse culverts will be sized to cope with a minimum 100-year flood event. All pipe culverts will be a minimum of 900mm in diameter regardless of the anticipated flood flow.
PD25	All new permanent culverts in Class 1 and Class 2 type watercourses will be bottomless or clear spanning.
PD26	If works are programmed to begin in the Hen Harrier breeding season (March to August) confirmatory hen harrier breeding surveys will be completed, before such works initiate, such that all pre-breeding nuptial activity, nesting activity and active nests are recorded within 2km of the construction works area boundary. These surveys will be completed prior to the start-up of all construction activities, until construction is complete and for 3 years thereafter. No construction works will take place within 500m of an active hen harrier breeding attempt or active nesting activity, during the breeding season (March to August).
PD27	During the hen harrier roosting season (October to February inclusive), construction works within 1000m of a roost will be limited to the period between one hour after sunrise to one hour before sunset.
PD28	Hedgerow removal and clearance of any other breeding bird vegetation will take place outside of the bird breeding season *i.e.* not during the period of March to August inclusive where possible. This includes hedgerow and scrub removal in addition to hedgerow trimming.
PD29	Confirmatory surveys for active Otter holts and activity (particularly holts at which breeding females or cubs are present) will be carried out 150m upstream and downstream of watercourse crossing locations.
PD30	All construction works within 150m of an active otter holt, will be carried out during daylight hours and outside of 2 hours after sunrise or before sunset during summer/outside of 1 hours after sunrise or before sunset during winter.
PD31	If an active holt (particularly holts at which breeding females or cubs are present) is located within 150 meters of the watercourse crossing points, no works will be undertaken *while cubs are present in the holt* and NPWS will be notified immediately

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PD ID	UWF Grid Connection Project Design (PD) Environmental Protection Measure
PD32	No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding otter Holts, and light work, such as digging by hand or scrub clearance will not take place within 15m of such holts, except under license.
PD33	The prohibited working area associated with otter holts will, where appropriate, be fenced with temporary fencing prior to any possibly invasive works and declared as 'out of bounds'. Fencing will be in accordance with Clause 303 of the NRA's Specification for Roadworks (National Roads Authority). Appropriate awareness of the purpose of the enclosure will be conveyed through toolbox talks with site staff and sufficient signage will be placed on each exclusion fence. All contractors or operators on site will be made fully aware of the procedures pertaining to each affected holt (NRA, 2006) and subject to audits and non-conformance records in the event of non-compliance, to be included in reports submitted to Local Authorities and relevant Statutory Consultees.
PD45	At Mountphilips Substation, water for welfare facilities will be obtained from a Rain Water Harvesting system. Waste water will be collected in tanks and removed from site by an appropriately licensed operator, for treatment in a licensed water treatment plant. These two measures will avoid the need for a new well or mains water connection and will avoid the need to treat waste water on-site.
PD46	Mountphilips Substation will have a permanent surface water drainage network in place which will include check dams. These check dams will settle suspended solids in water runoff while also slowing down the rate of water run-off from these areas.
PD47	All Joint Bays will be located at least 25m from a Class 1 or Class 2 watercourse, with 35 no. of the total 38 no. located greater than 50m from a Class 1 or Class 2 watercourse.
PD48	Only precast concrete chambers will be used at joint bays locations. No batching of wet cement will take place on-site.
PD49	Lower River Shannon SAC: The route of the 110kV UGC is located along an existing farm track within the SAC boundary. Construction works will be confined to the existing track within the SAC boundary.
PD50	Lower River Shannon SAC: There will be no storage of overburden within the Lower River Shannon SAC
PD51	Lower River Shannon SAC: All excavated material will be removed for temporary or permanent storage at a suitable location more than 100m away from the Newport (Mulkear) River, Clare River and Bilboa River.
PD52	Lower River Shannon SAC: No in-streams works are proposed at the Newport (Mulkear) River and Bilboa River crossings (which are located within the SAC) and therefore there will be no placement of cement within the river channels. The 110kV UGC will be installed by horizontal directional drilling technique.
PD53	Lower River Shannon SAC: All runoff from the construction works areas associated with the horizontal directional drilling works at the Newport (Mulkear) River and Bilboa River (which are located within the Lower River Shannon SAC) and at the Clare River (which is located upstream of the SAC), will be directed into a suitable water treatment train such as a Siltbuster and treated for sediment. This will also mean that in the unlikely event of an oil/fuel spill or leak, any contaminated water can be contained and removed off-site.
PD54	Lower River Shannon SAC: At the Newport (Mulkear) and Bilboa River crossings, drilling activities will be carried out at least 15m from the Lower River Shannon SAC boundary. Double silt fencing will be set up between the drilling rig and the SAC boundary – the 1st silt fence close to the rig and the 2nd silt fence close to the SAC boundary. No works or activities will be conducted on the SAC side of these fences. For the Clare River (which is not in an SAC) drilling activities will be carried out at least 15m away from the river bank. Double silt fencing will be set up as before and no works or activities will be conducted on the river side of these fences.
PD55	Lower River Shannon SAC: Drilling fluid returns will be contained within a sealed tank / sump, and pumped onto a skip for removal off-site to an appropriately licenced facility.

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PD ID	UWF Grid Connection Project Design (PD) Environmental Protection Measure
PD56	Lower River Shannon SAC: The drilling works at the Newport (Mulkear) River and Bilboa River will not be carried out during the months of May, June or July.
PD57	Lower River Shannon SAC: There will be no refuelling of vehicles or plant, no storage of fuels and no overnight parking permitted within the boundary of the Lower River Shannon SAC.
PD58	Lower River Shannon SAC: There will be no storage of fuels within 100m of the Newport (Mulkear) River, Clare River or Bilboa River.
PD62	Slievefelim to Silvermine Mountain SPA: All new permanent access roads within the SPA will be 'concealed access roads' which will be created immediately following construction works by covering the hardcore surface of the new road with a vegetated layer using the following method - firstly a geotextile material is laid on the road, covered in a layer of load bearing root-zone mix of peat and stone and then covered in turn by interlocking rigid geocells. The geocells and roadside berms (where present) will be planted with a mix of mature native Irish or Scottish heathers and grasses, with the mix depending on location. Where heather is being planted a depth of at least 150mm of peat will be provided. These 'concealed access roads' will provide a load bearing surface for occasional maintenance vehicles. Within the SPA, the establishment of the Concealed Access Roads will be overseen by a competent peatland ecologist and a hen harrier expert.
PD63	Slievefelim to Silvermine Mountain SPA: All temporary storage berm locations will be re-instated to the biodiversity value of the underlying habitat. Permanent berms will be immediately re-seeded with native heather and upland grass species. Harvester crossing points will be covered with topsoil and reseeded immediately as will any other temporary land-use change locations. Within the SPA, this reinstatement will be overseen by a competent peatland ecologist and a hen harrier expert, outside the SPA this reinstatement will be overseen by the Project Ecologist.
PD64	Slievefelim to Silvermine Mountain SPA: Annual visual inspections of the lands over the 110kV UGC and the testing/inspection/planned maintenance at Joint Bays, will be scheduled outside of the hen harrier breeding season, on those parts of the 110kV UGC which occurs within the boundary of the Slievefelim to Silvermines SPA.

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5.3.1.2 Environmental Protection Measures as part of the UWF Related Works design

The following protective measures (Project Design Measures) for UWF Related Works have been developed by the authors of this NIS along with the authors of the EIAR Water chapter (Hydro Environmental Services). These Project Design Measures are listed below and are included in the Description of UWF Related Works (A5) and in the UWF Related Works Environmental Management Plan (A10).

PD ID	UWF Related Works Project Design Environmental Protection Measure
PD01	All construction works will be carried out during daylight hours.
PD05	Land reinstatement will not be carried out during very wet weather or when the soil is waterlogged.
PD06	If any compaction has occurred along the construction works area, these areas will be ploughed with a sub-soiler to loosen the subsoil layer
PD07	Construction traffic will be restricted to the construction works area and tracking across adjacent ground will not be permitted
PD09	New permanent access roads will have a permanent surface water drainage network in place which will include check dams. These check dams will settle suspended solids in water runoff while also slowing down the rate of water run-off from these areas.
PD10	Only precast concrete culverts or structures will be used at watercourse crossing locations. No batching of wet cement will take place on-site.
PD11	Instream construction works will be followed by site-specific reinstatement measures to ensure the restoration of flow character and morphology within the affected reach. Measures will include: bank stabilisation using boulder armour or willow/brush bank protection; reinstatement of bank slope and character, creation of compound channels where necessary; reinstatement of instream flow features such as boulder substrates, pool / riffle sequences, or spawning cobbles; and planting along the riparian margin to stabilise banks, add flood protection and provide riparian buffer.
PD12	A phased approach will be undertaken in relation to watercourse crossing works, earthworks, forestry felling and excavation dewatering, where these works occur within 50m of a Class 1 or Class 2 watercourse. The phased approach will only permit one of main potential sediment producing activities, listed above, to be carried out within 50m of a Class 1 or Class 2 watercourse, at any one time.
PD13	All excavated material will be removed for temporary or permanent storage at a suitable location more than 50m away from all other Class 1 and Class 2 watercourses.
PD14	Temporary silt control methods such as silt fencing or containment berms will be placed around all overburden storage areas.
PD15	Permanent overburden storage berms will be graded and seeded immediately after emplacement.
PD16	For works within 50m of a Class 1 or Class 2 watercourse, additional mitigation measures include double silt fencing, temporary drain blocking, placement of straw bale arrangements along preferential surface water flowpaths and, where necessary, the use of matting to prevent ground erosion and rutting.
PD17	Where dewatering of trenches or excavations is required, there will be no direct discharge of treated water into any watercourse or drain. Rather all pumped water will be treated prior to discharge using an infiltration trench or settlement pond or suitable water treatment train such as a Siltbuster, as appropriate.
PD18	There will be no refuelling of vehicles or plant permitted within 100m of a watercourse
PD19	The main fuel stocks for, and chemical wastes arising from, construction activities will be stored in a designated location, away from main traffic activity, within the temporary compound. All fuel will be stored in bunded, locked storage containers.
PD20	Overnight parking of plant and machinery will only be permitted at locations which are greater than 50m from watercourses and where there is an existing hard-core surface in place.
PD21	No refuelling of plant or equipment will be permitted within 100m of identified wells

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PD ID	UWF Related Works Project Design Environmental Protection Measure
PD22	In-stream works at Class 1 and Class 2 watercourses will only be undertaken during the IFI specified period (July, August and September) and will be carried out to best practice (IFI, 2016).
PD23	In-stream works will not be undertaken without isolation of flow within the watercourse, any fish within the isolated section will be removed using electrofishing and, following collection of biometrics, transferred immediately downstream of the crossing point and placed back in the water. The water will then be isolated from the works by over pumping, flume (pipe) or channel diversion methods.
PD24	All new permanent watercourse culverts will be sized to cope with a minimum 100-year flood event. All pipe culverts will be a minimum of 900mm in diameter regardless of the anticipated flood flow.
PD25	All new permanent culverts on Class 1 and Class 2 type watercourses will be bottomless or clear spanning.
PD26	If works are programmed to begin in the Hen Harrier breeding season (March to August) confirmatory hen harrier breeding surveys will be completed, before such works initiate, such that all pre breeding nuptial activity, nesting activity and active nests are recorded within 2km of the construction works area boundary. These surveys will be completed prior to the start-up of all construction activities, until construction is complete and for 3 years thereafter. No construction works will take place within 500m of an active hen harrier breeding attempt or active nesting activity, during the breeding season (March to August).
PD27	During the hen harrier roosting season (October to February inclusive), construction works within 1000m of a roost will be limited to the period between one hour after sunrise to one hour before sunset.
PD28	Hedgerow removal and clearance of any other breeding bird vegetation will take place outside of the bird breeding season *i.e.* not during the period of March to August inclusive where possible. This includes hedgerow and scrub removal in addition to hedgerow trimming.
PD29	Confirmatory surveys for active Otter holts and activity (particularly holts at which breeding females or cubs are present) will be carried out 150m upstream and downstream of watercourse crossing locations.
PD30	All construction works within 150m of an active otter holt, will be carried out during daylight hours and outside of 2 hours after sunrise or before sunset during summer/outside of 1 hours after sunrise or before sunset during winter.
PD31	If an active holt (particularly holts at which breeding females or cubs are present) is located within 150 meters of the watercourse crossing points, no works will be undertaken *while cubs are present in the holt* and NPWS will be notified immediately
PD32	No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding otter Holts, and light work, such as digging by hand or scrub clearance will not take place within 15m of such holts, except under license.
PD33	The prohibited working area associated with otter holts will, where appropriate, be fenced with temporary fencing prior to any possibly invasive works and declared as 'out of bounds'. Fencing will be in accordance with Clause 303 of the NRA's Specification for Roadworks (National Roads Authority). Appropriate awareness of the purpose of the enclosure will be conveyed through toolbox talks with site staff and sufficient signage will be placed on each exclusion fence. All contractors or operators on site will be made fully aware of the procedures pertaining to each affected holt (NRA, 2006) and subject to audits and non-conformance records in the event of non-compliance, to be included in reports submitted to Local Authorities and relevant Statutory Consultees.

REFERENCE DOCUMENT

5.3.1.3 Environmental Protection Measures as part of the UWF Replacement Forestry design

The following protective measures (Project Design Measures) for UWF Replacement Forestry have been developed by the authors of this NIS along with the authors of the EIAR Water chapter (Hydro Environmental Services). These Project Design Measures are listed below and are included in the Description of UWF Replacement Forestry (A6).

PD ID	Environmental Protection Measure for UWF Replacement Forestry
RF-PD 01	All planting and maintenance activities will be carried out during daylight hours
RF-PD 02	The lands will be planted by hand, using spades and hand tools.
RF-PD 03	No pesticide or fertilizer will be used at the UWF Replacement Forestry site.
RF-PD 04	There will be no refuelling of vehicles or plant, no storage of fuels and no overnight parking permitted within the site.
RF-PD 05	A water setback from the watercourse which flows through the site will be established during planting works. The setback will be 10m from the edge of the watercourse. No planting or other works will be carried out in this 10m wide buffer area. Native woodland will be planted beyond this distance in accordance with Silvicultural Standards for Native Woodland Establishment GP9 & GP10 (Department of Agriculture, Food and the Marine, 2015).
RF-PD 06	No planting works will take place within 500m of an active hen harrier nest, or active nesting activity, during the months of March to August. Additionally, during the winter season, October to February, planting works will only be carried out during the period between one hour after sunrise and one hour before sunset in areas within 1000m of an active winter roost.
RF-PD 08	Confirmatory surveys for active Otter holts and activity (particularly holts at which breeding females or cubs are present) will be carried out 150m upstream and downstream of watercourse crossing locations.
RF-PD 09	All construction works within 150m of an active otter holt, will be carried out during daylight hours and outside of 2 hours after sunrise or before sunset during summer/outside of 1 hours after sunrise or before sunset during winter.
RF-PD 10	If an active holt (particularly holts at which breeding females or cubs are present) is located within 150 meters of the watercourse crossing points, no works will be undertaken *while cubs are present in the holt* and NPWS will be notified immediately.
RF-PD 11	No wheeled vehicles (of any kind) will be used within 20m of active, but non-breeding otter Holts, and light work, such as digging by hand or scrub clearance will not take place within 15m of such holts, except under license.
RF-PD 12	The prohibited working area associated with otter holts will, where appropriate, be fenced with temporary fencing prior to any possibly invasive works and declared as 'out of bounds'. Fencing will be in accordance with Clause 303 of the NRA's Specification for Roadworks (National Roads Authority). Appropriate awareness of the purpose of the enclosure will be conveyed through toolbox talks with site staff and sufficient signage will be placed on each exclusion fence. All contractors or operators on site will be made fully aware of the procedures pertaining to each affected holt (NRA, 2006) and subject to audits and non-conformance records in the event of non-compliance, to be included in reports submitted to Local Authorities and relevant Statutory Consultees.

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5.3.1.4 Environmental Protection Measures as part of the consented Upperchurch Windfarm

The consented Upperchurch Windfarm includes planning permission conditions and a number of protective and management Environmental measures. These measures are included in the 2013 EIS, 2013 RFI and 2014 Grant of Permission, see A16. These measures are also included in the Compiled Description of consented Upperchurch Windfarm (A7). These measures will be implemented through two separate Environmental Management Plans for the UWF; one for the construction stage and one for the early operational stage. A copy of these Plans was submitted with the 2013 RFI documents. The relevantplanning permission conditions, in respect of European Sites, are listed below.

Condition-1	The development shall be carried out and completed in accordance with the plans and particulars lodged with the application.
Condition-2	All environmental mitigation measures set out in the Environmental Impact Statement, Natura Impact Statement and associated documentation shall be implemented in full.
Condition-6	Prior to commencement of construction, details of the phasing of the construction works shall be agreed with the National Parks and Wildlife Service
Condition-10	The construction works shall be carried out in accordance with construction details submitted to the planning authority, including the Construction Management Plan.
Condition-15	The management of drainage and surface water during the construction stage shall be in accordance with the details submitted in the Construction Management Plan, the Ecological Management Plan and the Environmental Management Plan. Furthermore, revised drawings shall be submitted to the planning authority prior to commencement showing compliance with condition 15 regarding fuel storage, designated refuelling areas, wheel wash areas and concrete wash areas.
Condition-16	There shall be no new provision for discharge of foul effluent on site without a prior grant of planning permission.
Condition-17	Prior to construction between mid-March and mid-August, a survey for breeding hen harriers shall be carried out. Taking account of the results of this survey, no construction works shall be carried out within the above period within 500m of a pre nesting breeding site, except with the written approval of the National Parks and Wildlife Service.
Condition-18	The Ecological Management Plan submitted shall be implemented in full. A timescale of enhancement of foraging areas, rush management, hedgerows enclosures and trees and land management shall be agreed with the planning authority following consultation with the National Parks and Wildlife Service prior to commencement. A programme of ongoing surveys and monitoring in years 2 and 3 after commencement of the operation of the turbines shall be submitted and agreed in writing with the planning authority following consultation with the National Parks and Wildlife Service prior to commencement.
Condition-19	Details as outlined in the Ecological Management Plan shall be implemented. A timescale for implementation shall be submitted and agreed in writing with the planning authority following consultation with the National Parks and Wildlife Service prior to commencement
Condition-21	Mitigations measures submitted for the protection of water quality shall be implemented in full and according to best practice guidelines. The works shall be supervised as set out in the Construction Management Plan. In the event of a water pollution incident or damage the relevant authorities shall be immediately notified and works cease until authorized to continue. A programme of hydrographic monitoring shall be carried out over a period commencing pre-construction and concluding in year 3 of the operational phase of the development.

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5.3.1.5 Environmental Protection Measures as part of the UWF Other Activities

In relation to the UWF Other Actiivites (Element 5), the developer commits to the implementation of the following environmental protection measures, which are also included in the Description of UWF Other Activities (A8).

Except with the approval of the National Parks and Wildlife Service: no activities will be carried out within 500 metres of an active hen harrier nest or nesting attempt; no activities will be carried out within 30m of an active main badger set or within 150m of an active otter holt.
In order to prevent disturbance to breeding birds, tree trimming for Haul Route Activities will be conducted outside of the bird breeding season

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5.3.2 Consideration of Best Practice Measures

As well as the Project Design Measures, the following additional protective measures (Best Practice Measures (BPM) measures) which will be implemented are herein presented for the first time within the context of likely significant effects on European Sites. The Best Practice Measures which are considered as pertinent to European Sites based on the source impact pathways identified at Stage 1, are identified in the sections 5.3.2.1 to 5.3.2.5 below.

The Best Practice Measures (BPM's) set out in the Project Description(s) (see Appendix A4-A8 inclusive of this document) and the EMP for both the UWF Grid Connection and Related Works (Appendix 9 and 10 of this document) which are integral to the project and considered as pertinent to European Sites based on the source impact pathways identified at Stage 1, are summarised below. Adherence to these the Best Practice Mmeasures will be a contractual obligation on appointed contractors. The implementation of all Biodiversity related measures will be monitored by the appointed Project Ecologist.

5.3.2.1 Best Practice Measures as part of the UWF Grid Connection design

The following protective measures (Best Practice Measures) have been developed for UWF Grid Connection by the authors of this NIS along with the authors of the EIAR Water chapter (Hydro Environmental Services. These Best Practice Measures are included in full in the EIAR Biodiveristy Chapter (A11) and in the UWF Grid Connection Environmental Management Plan (A9).

BPM ID	Best Practice Measure
GC-BPM-01	Measures for Protection of Surface Water Quality during Watercourse Crossing Open Trench Works where the Dam and Over Pump Method is used
GC-BPM-02	Measures for Protection of Surface Water Quality during Watercourse Crossing Open Trench Works where dam and Pipe/ Flume method is used
GC-BPM-03	Measures for Protection of Surface Water Quality during Stream Crossing Open Trench Works where the Channel Diversion Method is Used
GC-BPM-04	Measures for Protection of Surface Water Quality during Widening or Replacing an Existing Culvert
GC-BPM-05	Surface Water Quality Protection Measures During Excavation Works Within 50m of a Watercourse
GC-BPM-06	Surface Water Quality Protection Measures During Tree Felling Works
GC-BPM-07	Protection of Surface Water and Groundwater Quality during use of Cement Based Compounds
GC-BPM-08	Protection of Surface Water and Groundwater Quality During Storage and Handling of Fuels, Oils and Chemicals
GC-BPM-09	Design of New Permanent Watercourse Crossing Structures to Prevent Flood Risk
GC-BPM-10	Surface Water Quality Protection Measures During Temporary Storage of Overburden
GC-BPM-11	Surface Water Quality Protection Measures during Permanent Storage of Overburden
GC-BPM-12	Monitoring of nesting and roosting Hen Harrier (*Circus cyaneus*)
GC-BPM-16	Monitoring of non-native invasive plant species
GC-BPM-17	Best practice measures for the removal of vegetation during construction
GC-BPM-18	Best practice for the protection and preservation of tree roots during the construction phase
GC-BPM-21	Disturbance and/or physical injury to Other Mammals
GC-BPM-22	Management of general non-native invasive species

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BPM ID	Best Practice Measure
GC-BPM-23	Best practice methods to ensure the protection of common frog (*Rana temporaria*) and smooth newt (*Triturus (Lissotriton) vulgaris*).
GC-BPM-24	Best practice methods to ensure the protection of Viviparous lizard (*Lacerta (Zootoca) vivipara*)
GC-BPM-28	Minimising Disturbance and Damage to Land
GC-BPM-29	Minimising Dust Emissions From Site Activities
GC-BPM-33	Surface Water Quality Protection Measures For Site Runoff during the Mountphilips Substation Construction Works
GC-BPM-34	Surface Water Quality Protection Measures During Direction Drilling at the Newport (Mulkear) River, Bilboa River and Clare River watercourse crossings.

5.3.2.2 Best Practice Measures as part of the UWF Related Works design

The following protective measures (Best Practice Measures) have been developed for UWF Related Works by the authors of this NIS along with the authors of the EIAR Water chapter (Hydro Environmental Services). These Best Practice Measures are included in full in the EIAR Biodiveristy Chapter (A12) and in the UWF Related Works Environmental Management Plan (A10).

BPM ID	Best Practice Measure
RW-BPM-01	Measures for Protection of Surface Water Quality during Watercourse Crossing Open Trench Works where the Dam and Over Pump Method is used
RW-BPM-02	Measures for Protection of Surface Water Quality during Watercourse Crossing Open Trench Works where dam and Pipe/ Flume method is used
RW-BPM-03	Measures for Protection of Surface Water Quality during Stream Crossing Open Trench Works where the Channel Diversion Method is Used
RW-BPM-04	Measures for Protection of Surface Water Quality during Widening or Replacing an Existing Culvert
RW-BPM-05	Surface Water Quality Protection Measures During Excavation Works Within 50m of a Watercourse
RW-BPM-06	Surface Water Quality Protection Measures During Tree Felling Works
RW-BPM-07	Protection of Surface Water and Groundwater Quality during use of Cement Based Compounds
RW-BPM-08	Protection of Surface Water and Groundwater Quality During Storage and Handling of Fuels, Oils and Chemicals
RW-BPM-09	Design of New Permanent Watercourse Crossing Structures to Prevent Flood Risk
RW-BPM-10	Surface Water Quality Protection Measures During Temporary Storage of Overburden along the Whole UWF Project areas
RW-BPM-11	Surface Water Quality Protection Measures during Permanent Storage of Overburden along the Whole UWF Project areas
RW-BPM-12	Monitoring of nesting and roosting Hen Harrier (Circus cyaneus)
RW-BPM-16	Monitoring of non-native invasive plant species
RW-BPM-17	Best practice measures for the removal of vegetation during construction
RW-BPM-18	Best practice for the protection and preservation of tree roots during the construction phase

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BPM ID	Best Practice Measure
RW-BPM-21	Disturbance and/or physical injury to Other Mammals
RW-BPM-22	Management of general non-native invasive species
RW-BPM-23	Best practice methods to ensure the protection of common frog (Rana temporaria) and smooth newt (Triturus (Lissotriton) vulgaris).
RW-BPM-24	Best practice methods to ensure the protection of Viviparous lizard (Lacerta (Zootoca) vivipara)
RW-BPM-28	Minimising Disturbance and Damage to Land
RW-BPM-29	Minimising Dust Emissions From Site Activities

5.3.2.3 Best Practice Measures as part of the UWF Replacement Forestry design

The following protective measures (Best Practice Measures) have been developed for UWF Replacement Forestry by the authors of this NIS along with the authors of the EIAR Water chapter (Hydro Environmental Services). These Best Practice Measures are included in full in the EIAR Biodiveristy Chapter (A13).

RF-BPM-01	Monitoring of non-native invasive plant species
RF-BPM-02	Management of general non-native invasive species
RF-BPM-03	Best practice methods to ensure the protection of Viviparous lizard (*Lacerta (Zootoca) vivipara*)

5.3.2.4 Best Practice Measures as part of the Upperchurch Windfarm design

The Management Plans and mitigation measures which were included in the 2013 EIS and 2013 RFI include best practice measures to protect the receiving environment.

In addition, Condition-21 includes: Mitigations measures submitted for the protection of water quality shall be implemented in full and according to best practice guidelines. The works shall be supervised as set out in the Construction Management Plan. In the event of a water pollution incident or damage the relevant authorities shall be immediately notified and works cease until authorized to continue. A programme of hydrographic monitoring shall be carried out over a period commencing pre-construction and concluding in year 3 of the operational phase of the development.

Treatment of waste arising during construction, operation and decommissioning, in line with Best Practice is described in Section A5.5-5.4.3 of Appendix A7 of this document.

5.3.2.5 Best Practice Measures as part of the UWF Other Activities design

In relation to the UWF Other Actiivites (Element 5), the developer commits to the implementation of the following Best Practice MeasuresThe following Best practice Measures in respect of Invasive Alien Species will be implemented, in addition to Best Practice measures and in respect of activities which may involve disturbance to lands or activities near watercourses (as part of the Upperchurch Hen Harrier Scheme for

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example, or in relation to required monitoring). These Best Practice Measures are included in full in the Description of UWF Other Activities (A8).

OA-BPM-01	Management of general non-native invasive species
OA-BPM-02	Surface Water Quality Protection Measures During Excavation Works Within 50m of a Watercourse
OA-BPM-03	Minimising Disturbance and Damage to Land

5.3.3 Environmental Management Plans

5.3.3.1 Management Plans as part of the UWF Grid Connection design

The implementation of the Project Design Measures and Best Practice Measures along with monitoring arrangements and emergency response procedures will be management under a dedicated UWF Grid Connection Environmental Management Plan (copy included as Appendix A9). Management plans in respect of Surface Water Quality Management, Invasive Species Management and Waste Management, have also been developed and are provided in Tabs 4, 5 and 6 respectively of the appended Grid Connection Environmental Management Plan (Appendix A9).

5.3.3.2 Management Plans as part of the UWF Related Works design

The implementation of the Project Design Measures and Best Practice Measures along with monitoring arrangements and emergency response procedures will be managed under a dedicated UWF Related Works Environmental Management Plan (copy included as Appendix A10). Management plans in respect of Surface Water Quality Management, Invasive Species Management and Waste Management, have also been developed and are provided in Tabs 4, 5 and 6 respectively of the appended UWF Related Works Environmental Management Plan (Appendix A10).

5.3.3.3 Management Plans as part of the UWF Replacement Forestry design

The Invasive Species Management Plan (ISMP) in respect of UWF Replacement Forestry is included as Appendix 5.2 of Chapter 5: Description of the UWF Replacement Forestry, which is appended to this document (Appendix A6).

5.3.3.4 Management Plans as part of the Upperchurch Windfarm consented design

Environmental protection measures will be implemented during the development of the Upperchruch Windfarm through the Construction Environmental Management Plan, the Early Operational Phase Environmental Management Plan and the Ecological Management Plan. The implementation of these plans is a condition of planning permission (Condition No. 15 of the 2014 Grant of Permission for Upperchurch Windfarm).We refer Section 5.3.1.4.

5.3.3.5 Management Plans as part of the UWF Other Activities design

No bespoke management plans are required in respect of Other Activities. Activities in themselves comprise elements of monitoring (such as water quality, invasive species, monitoring of works, and monitoring and auditing of compliance) which are included already within the respective management plans associated with the UWF Grid Connection, UWF Related Works and Upperchurch Windfarm as appropriate.

REFERENCE DOCUMENT

5.3.4 Environmental Emergency Response Measures

5.3.4.1 Environmental Emergency Response Measures as part of the UWF Grid Connection design

Emergency or contingency measures relating to landslip, frac-out and fuel or oil spillage are included in Section 6 of the UWF Grid Connection Environmental Management Plan (Appendix A9).

In respect of frac-out during drilling works, a full suite of contingency measures in line with Best Practice has been provided, with the likelihood of frac-out being based on a Horizontal Directional Drilling Risk Assessment which has been carried out by a suitably qualified expert[12]. This is included as Appendix 11.4 of the accompanying EIAR and Appendix A17 of this document.

5.3.4.2 Environmental Emergency Response Measures as part of the UWF Related Works design

Emergency or contingency measures relating to fuel or oil spillage, or significant pollution occurrence in local surface waters are included in Section 6 of the UWF Related Works Environmental Management Plan (Appendix A10).

5.3.4.3 Environmental Emergency Response Measures as part of the UWF Replacement Forestry design

Due to the nature of the planting works and management activities associated with UWF Replacement Forestry, no emergency response measures are required.

5.3.4.4 Environmental Emergency Response Measures as part of the Upperchurch Windfarm design

Environmental Accidents, Incidents and Corrective Actions Procedures are included in the Construction Environmental Management Plan for Upperchurch Windfarm (included in Appendix A16).
We refer Section 5.3.1.4.

5.3.4.5 Environmental Emergency Response Measures as part of the UWF Other Activities design

Due to the nature of activities, no emergency response measures are required.

[12] GEO DRILLING SOLUTIONS (2018). *UWF Grid Connection HDD Risk Assessment: A preliminary report reviewing the potential for frac-out using HDD at three river crossing locations*. Geo Drilling Solutions, Dunmahon, Ardee Road, Dundalk, Co. Louth.

REFERENCE DOCUMENT

5.3.5 Evaluation of Effects on Qualifying Interests and Special Conservation Interests

The Screening stage evaluated the potential for the five individual Elements of the Whole UWF Project to give rise to significant effects on European Sites via identified impact pathways (Section 4). Potential significant effects were identified with regard to individual Qualifying Interests and Special Conservation Interests, designated within SAC and SPA sites respectively. These effects are evaluated further within the NIS, to determine whether the project will affect the conservation status of these conservation interests, and thus the overall integrity of any European Site.

The evaluation of the Whole UWF Project Elements 1 to 5 takes account of the Project Design Measures, Best Practice Measures, Emergency Response Procedures, and Management Plans in respect of Waste, Surface Water and Invasive Species set out in the Environmental Management Plans provided in Appendix A9/ and A10 and the measures and management plans set out in the 2013 RFI for the consented Upperchurch Windfarm which is included in A16 of this document, along with the and Project Descriptions provided as Appendix A4-A8 of this document, in making a determination as to the character, magnitude and significance of any potential effects. The impact assessment for each potential projectProject Element is presented individually in tabular format and evaluated separately for each European Site carried forward from the Screening exercise.

REFERENCE DOCUMENT

European Site: Lower River Shannon SAC (002165)

Riparian Habitat Degradation

Table 5.5: Riparian Habitat Degradation

Qualifying Interests	Floating river vegetation (3260)/ Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0) Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) Otter (Lutra lutra)
Project Stage	Construction

Potential Impact Source Identified: Land Take/ Reinstatement/Sediment/Movement of Soils/Instream Works/Machinery Movement/Excavation Works/Dewatering of excavations/Permanent Access Roads and Hardstanding/Cement based materials/Hydrocarbons/ Overburden Storage/ Groundworks/ Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)/Reinstatement (Alluvial forests only)

Impact Pathway: Soils/ Surface Water Flowpaths/ Movement of Soils/ Surface Water

Effect Description: The riparian corridor along a watercourse relates to the interface between the aquatic habitat, the bankside vegetation and terrestrial environment. An intact, semi-natural riparian zone has significant beneficial services in the protection of instream aquatic habitat quality, food/nutrient contributions, and temperature regulation. Existing riparian habitat quality within the study area is subject to afforestation and agricultural management, including clearance works, drainage maintenance and channelization works.

The removal of, or damage to, riparian vegetation during instream works or excavation/ground clearance works in close proximity to any watercourse has the potential to impact on the quality of riparian habitats which in turn can affect watercourse morphology, shading, bank stability, and nutrient and sediment loading and result in indirect effects on aquatic and water-dependant habitats and species within direct proximity of the works and downstream.

Project design: Following works at or in close proximity to watercourses (Class 1 or Class 2), reinstatement works will be carried out which will include site-specific bank stabilisation measures using boulder armour or willow/brush bank protection; reinstatement of bank slope and character; creation of compound channels where necessary; and replanting of riparian buffer zones with suitable native species to manage flood flows and buffer run-off.

Individual Project Elements of the Whole UWF Project

Description of the magnitude and significance of the impact caused by each project element individually

Element 1: UWF Grid Connection

Effect Magnitude:

From a total of 90 No. watercourse crossings within the construction works area boundary associated with the UWF Grid Connection, riparian habitat will be affected at **34 No**. watercourse crossings identified as having fisheries value within the UWF Grid Connection construction works area boundary. The effect on the riparian and bankside habitat will be greatest at instream works locations (15 No.).

The duration of any loss of well-structured riparian habitat impacts is evaluated with regard to the direct aquatic habitat services provided by the riparian zone (bank stabilization and erosion control, shading and temperature regulation), as well as the indirect inputs such as habitat for invertebrate food for fish and aquatic biota, reduction in light for aquatic flora, flood control and buffering effects in relation to run-off. Riparian habitat impacts will be reversible with reinstatement and will be temporary to short-term, limited to the construction phase and early operational stage until vegetation has re-established.

Qualifying Interests	Floating river vegetation (3260)/ Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0) Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) Otter (Lutra lutra)

Significance: No adverse effect on Site Integrity due to:

1. The limited extent of instream works, within defined works areas, will reduce the potential spatial area.
2. Existing riparian habitat quality within the proposed works areas is subject to afforestation and agricultural management, including clearance works, drainage maintenance and channelization works.
3. Riparian habitat impacts will be limited to the construction phase, reversible, temporary and short-term and in line with baseline conditions.
4. Riparian habitat impacts are to be managed with project reinstatement measures (Project Design Mitigation Measures) and is therefore reversible;
5. Bank works are required at stream crossing locations; alternatives to riparian clearance are not available.
6. The majority (~62%) of the watercourse crossings within the Shannon Catchment (n=63) are at least 4km upstream of the Lower River Shannon SAC, with ~42% being more than 9km upstream of the SAC.

Element 2: UWF Related Works

Effect Magnitude:

Riparian habitat will be affected at **6 No**. watercourse crossings identified as having fisheries value, out of a total of 32 watercourse crossings within the construction works area boundary associated with the UWF Related Works.

The duration of any loss of well-structured riparian habitat impacts is evaluated with regard to the direct aquatic habitat services provided by the riparian zone (bank stabilization and erosion control, shading and temperature regulation), as well as the indirect inputs such as habitat for invertebrate food for fish and aquatic biota, reduction in light for aquatic flora, flood control and buffering effects in relation to run-off. Riparian habitat impacts will reversible with reinstatement and will be temporary to short-term, limited to the construction phase and early operational stage until vegetation has re-established.

Significance: No adverse effect on Site Integrity due to:

1. Riparian habitat impacts that may affect aquatic ecology and fisheries receptors are limited to discrete locations at watercourse crossing locations within minor watercourses;
2. The general context of the watercourses affected comprises managed agricultural lands and open uplands with poorly-developed riparian habitat, where well-developed riparian habitat occurs it comprises willow species which regenerate quickly;
3. Riparian habitat impacts are to be managed with project reinstatement measures (Project Design Mitigation Measures) and is therefore reversible;
4. Riparian habitat impacts will be limited to the construction phase, reversible, temporary and short-term and in line with baseline conditions. Bank works are required at stream crossing locations; alternatives to riparian clearance are not available.
5. Impacts to the riparian habitat are temporary to short-term and reversible with reinstatement.

Element 3: UWF Replacement Forestry – *Screened Out at Stage 1*

Effect Magnitude: Not Applicable – Screened Out at Stage 1

Significance: No likelihood of significant effects

Element 4: Upperchurch Windfarm – *Screened Out at Stage 1*

Qualifying Interests	Floating river vegetation (3260)/ Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0) Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) Otter (Lutra lutra)

Effect Magnitude: Not Applicable – Screened Out at Stage 1N

Significance: No likelihood of significant effects

Element 5: UWF Other Activities – *Screened Out at Stage 1*

Effect Magnitude: Not Applicable – Screened Out at Stage 1

Significance: No likelihood of significant effects

Whole UWF Project
Description of the in-combination effect of all five Individual Project Elements together

Effect Magnitude:
Riparian habitat will be affected at **40 No**. watercourse crossings identified as having fisheries value (one watercourse, WW2 associated with both the UWF Related Works and the Upperchurch Windfarm).

The spatial extent of such effects will occur within the footprint of the instream works, with the potential for direct impacts at the approach to watercourse crossing works areas.

Significance: No adverse effect on Site Integrity due to:

1. The watercourse crossing works required for the UWF Grid Connection are largely located within the River Shannon catchment while the watercourse crossings required for the Upperchurch Windfarm and UWF Related Works are largely located in the River Suir surface water catchment;
2. The limited extent of instream works, within defined works areas will reduce the potential spatial area.
3. The Class 1 and Class 2 watercourses where in-stream works are required are largely small headwater streams and therefore are likely to have relatively low flows during July to September;
4. Existing riparian habitat quality within the proposed works areas is subject to afforestation and agricultural management, including clearance works, drainage maintenance and channelization works.
5. Riparian habitat impacts will be limited to the construction phase, reversible, temporary and short-term and in line with baseline conditions. Bank works are required at stream crossing locations; alternatives to riparian clearance are not available
6. The duration of the impact is evaluated with regard to the aquatic habitat services and buffering effects provided by riparian habitats at each discrete works location. Such impacts are limited to the specific works location and do not interact with riparian habitat communities within the watercourse as a whole, or at a catchment level, in view of cumulative or synergistic project effects. Riparian habitat impacts are once-off, restricted to the period of works within or adjacent to the aquatic habitat and are thus not subject to sequential project effects.
7. Riparian habitat impacts are to be managed with project reinstatement measures (Project Design Mitigation Measures) and is therefore reversible;
8. Impacts to the riparian habitat are temporary to short-term and reversible with reinstatement.
9. The majority (~62%) of the watercourse crossings for the UWF Grid Connection within the Shannon Catchment (n=63) are at least 4km upstream of the Lower River Shannon SAC, with ~42% being more than 9km upstream of the SAC.

Lower River Shannon SAC (002165)

Disturbance to Fisheries

Table 5.5 Disturbance to Fisheries

Qualifying Interests	**Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis)**
Project Stage	Construction

Potential Impact Source Identified:
Land Take/ Reinstatement/ Instream Works/Machinery Movement/ Excavation Works/ Dewatering of excavations/ Drilling/ Noise and Human Disturbance/ Groundworks/Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)
Impact Pathway: Surface Water/ Visibility/ Ground and Air Vibrations/ Direct Contact

Impact Description:
Instream works and machinery operation within or in close proximity to any watercourse has the potential to directly disturb or displace salmonid fish and aquatic species within fish-bearing streams, or sensitive aquatic receptors Fish are likely to mobilise outside of their territories due to human disturbance but will return once the disturbance effect diminishes. Aquatic invertebrates are less sensitive to disturbance and displacement arising from human activity and are scoped out from evaluation of disturbance/displacement effects. The extent of disturbance or displacement of aquatic ecological receptors, including fish, will be limited to the direct footprint of any instream works within watercourses which support anadromous Atlantic salmon and resident Brown trout populations – i.e. Class 1 or Class 2 watercourses. Disturbance or displacement effects will be brief to temporary in nature, lasting for the duration of works at or in close proximity to Class 1 or Class 2 watercourses.

Individual Project Elements of the Whole UWF Project

Description of the magnitude and significance of the impact caused by each project element individually

UWF Grid Connection

Effect Magnitude:

Of the 90 No. watercourse crossings within the UWF Grid Connection construction works area boundary, 34 No. have been evaluated to have fisheries value.

Of these 34 No. watercourses, 15 No. will be subject to instream works and 3 no. will be subject to drilling activities, any fish present are likely to be affected for between 1 – 2 days at instream works locations and c.1 week at drilling locations. The frequency of these disturbance effects is once of for drilling activities, once for cables trenches with or without new permanent culverts and twice for temporary culverts (once for installation and once for removal).

The remaining crossings are over existing crossing structures which do not require any works and cables will be installed either under or over the structure, disturbance effects at these locations are Imperceptible.

Significance: No adverse effect on Site Integrity due to:

1. In-stream works will only be undertaken during the IFI specified period (July – September) for the Class 1 and Class 2 watercourses to avoid sensitive salmonid instream migration and spawning periods (Project Design Mitigation Measure);
2. The Class 1 and Class 2 watercourses where in-stream works are required are largely small headwater streams and therefore are likely to have relatively low flows during July to September;
3. The in-stream works will not be undertaken without isolation of flow within the watercourse prior to the in-stream works commencing (Project Design Mitigation Measure);
4. There will be no direct discharge of pumped water into the watercourse during the works (we refer to outline construction methodologies in the EMP for UWF Grid Connection);

REFERENCE DOCUMENT

Qualifying Interests	**Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis)**

5. The extent of disturbance or displacement of aquatic ecological receptors, including fish, will be limited to the direct footprint of any instream works within watercourses which support anadromous Atlantic salmon and resident Brown trout populations. Additional disturbance effects will occur at the three river crossings, where the 110kV UGC will be installed using drilling techniques, where disturbance effects within the watercourse channel will be limited to the spatial extent of drilling activities.
6. The frequency of disturbance will be singular in the case of half of the locations
7. The duration of any disturbance impacts are considered with regard to fish species, protected Annex II aquatic invertebrates, and macroinvertebrate communities which support fish populations; such effects are evaluated to be temporary and reversible.
8. The majority (~62%) of the watercourse crossings within the Shannon Catchment are at least 4km upstream of the Lower River Shannon SAC, with ~42% being more than 9km upstream of the SAC.
9. The Conservation Objectives will not be undermined.

UWF Related Works

Effect Magnitude:

Of the 32 No. watercourse crossings within the UWF Related Works construction works area boundary, 6 No. have been evaluated to have fisheries value. Of these 6 No. watercourses, 5 No. will be subject to instream works (the remaining 1 no. crossing WW2 will use a clear span structure with no requirement for instream works). Any fish present are likely to be affected for between 1 – 2 days during instream works. The frequency of these disturbance effects is once for half of the locations (cables trenches with or without new permanent culverts) and twice for the remaining locations (temporary culverts: once for installation and once for removal).

Significance: No adverse effect on Site Integrity due to:

1. In-stream works will only be undertaken during the IFI specified period (July – September) for the Class 1 and Class 2 watercourses to avoid sensitive salmonid instream migration and spawning periods (Project Design (PD) Mitigation Measure);
2. The Class 1 and Class 2 watercourses where in-stream works are required are largely small headwater streams and therefore are likely to have relatively low flows during July to September;
3. The in-stream works will not be undertaken without isolation of flow within the watercourse prior to the in-stream works commencing (Project Design Measure);
4. There will be no direct discharge of pumped water into the watercourse during the works (Project Design Measure);
5. The singular frequency of any disturbance events at the half of the locations, and;
6. The duration of any disturbance impacts are considered with regard to fish species, protected Annex II aquatic invertebrates, and macroinvertebrate communities which support fish populations; such effects are evaluated to be temporary and reversible.
7. Only HW works locations HW7, HW8, HW9, HW10 are located within the Shannon catchment (within the Bilboa), with the majority of work locations within the Suir.
8. Only one watercourse (WW23) crossing (of 32 no. in total part of RW) is within the Shannon Catchment- and is not of fisheries value.
9. The Conservation Objectives will not be undermined.

UWF Replacement Forestry- *Screened Out at Stage 1*

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Significance: No likelihood of significant effects.

Upperchurch Windfarm - *Screened Out at Stage 1*

REFERENCE DOCUMENT

Qualifying Interests	**Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis)**

Effect Magnitude: Not Applicable – Screened Out at Stage 1

Significance: No likelihood of significant effects.

UWF Other Activities - Screened Out

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Significance: No likelihood of significant effects.

Whole UWF Project

Description of the in-combination effect of all five Individual Project Elements together

Effect Magnitude:

Direct disturbance or displacement of aquatic ecological receptors, including fish, will be limited to the footprint of any instream works and directly upstream and downstream of all crossings, temporary and permanent instream works structures and bank-side works. At the local level in the context of individual receptors, temporary displacement will be limited to the affected stretch of watercourse, without cumulative population-level impacts at a watercourse or catchment level. Additional disturbance effects within the watercourse channel will be limited to the spatial extent of drilling vibrations, trenching and ducting activities.

Significance: No adverse effect on Site Integrity due to:

1. In-stream works will only be undertaken during the IFI specified period (July – September) for the Class 1 and Class 2 watercourses to avoid sensitive salmonid instream migration and spawning periods (Project Design Mitigation Measure);
2. The Class 1 and Class 2 watercourses where in-stream works are required are largely small headwater streams and therefore are likely to have relatively low flows during July to September (Project Design Mitigation Measure);
3. The in-stream works will not be undertaken without isolation of flow within the watercourse prior to the in-stream works commencing (Project Design Mitigation Measure);
4. There will be no direct discharge of pumped water into the watercourse during the works (Project Design Mitigation Measure);
5. The singular frequency of any disturbance events at the half of the locations, and;
6. The duration of any disturbance impacts are considered with regard to fish species, protected Annex II aquatic invertebrates, and macroinvertebrate communities which support fish populations; such effects are evaluated to be temporary and reversible.
7. The majority (~62%) of the watercourse crossings for the UGC within the Shannon Catchment (n=63) are at least 4km upstream of the Lower River Shannon SAC, with ~42% being more than 9km upstream of the SAC.
8. The Conservation Objectives will not be undermined.

Lower River Shannon SAC (002165)

Changes in flow regime

Table 5.6: Changes in flow regime

Qualifying Interest	**Floating river vegetation (3260)/ Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)** **Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis)** **Otter (Lutra lutra)**
Project Stage	Construction

Potential Impact Source Identified: Sediment/Instream works/ Machinery movement;
Impact Pathway: Surface water; Land cover

Impact Description:
Watercourse morphology relates to the shape of a watercourse channel, its bed and banks and how erosion, transportation of water, sedimentation and the composition of riparian vegetation changes this shape over time. Direct impacts are identified to channel morphology and geomorphology (bed and banks of watercourses) due to instream works and sediment deposition. Aquatic species, which are likely to be present in fishery value watercourses at instream construction works locations, are reliant on instream habitat heterogeneity (riffle/glide/pool structure); along with the availability of peak flow flushes (flood/spate); the provision of flows for upstream/downstream migration (impassable barriers); and avoidance of channel constriction during low flow. Any change in watercourse morphology which affects channel flow regimes can result in cross factor effects on aquatic ecological communities and water-dependant habitats, which are likely to be present in fishery value watercourses at instream construction works locations. These communities are reliant on instream habitat heterogeneity (riffle/glide/pool structure); along with the availability of peak flow flushes (flood/spate); the provision of flows for upstream/downstream migration (impassable barriers); and avoidance of channel constriction during low flow.

Instream works are limited to the individual crossing points and include trenching works for underground cables, installation of temporary or permanent crossing structures and reinstatement works.

The reinstatement works will maintain the channel morphology, in line with IFI (2016) and will include site-specific bank stabilisation measures using boulder armour or willow/brush bank protection; reinstatement of bank slope and character; creation of compound channels where necessary; and reinstatement of instream flow features such as boulder substrates, pool / riffle sequences, or spawning cobbles.

The creation of adverse flow conditions or habitat limitations due to changes to flow or morphology will be limited to the specific works period within or adjacent to the aquatic habitat. Project Design Mitigation Measures include the use of culverts at all new permanent watercourse crossings which will be a minimum of 900mm in diameter and will be bottomless or clear spanning on all Class 1 and Class 2 type watercourse and the use of reinstatement of the banks and beds at crossing locations. In addition, in-stream works will only be undertaken during the IFI specified period (July – September) for the Class 1 and Class 2 watercourses (Project Design Mitigation Measure).

Individual Project Elements of the Whole UWF Project

Description of the magnitude and significance of the impact caused by each project element individually

UWF Grid Connection

Effect Magnitude:

Construction works will require crossings of 34 No. watercourses with fisheries value ((i.e. Class 1 or Class 2 watercourses); however, of these, instream works in watercourses with fisheries value will take place at 15 No. watercourse crossing locations, 9 of these crossings relate to temporary trenching works and/or the installation of a temporary crossing structure, while 6 No. relate to the installation of permanent crossing structures.

Qualifying Interest	**Floating river vegetation (3260)/ Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)** **Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis)** **Otter (Lutra lutra)**

At the 9 no. crossing points, changes to the flow regime will be brief to temporary and for the duration of the immediate works. Any temporary alteration to flows or morphology will be reversible and will be subject to seasonal constraints during sensitive aquatic species life stages (project design mitigation measure).

At the 6 no. new permanent crossing points, changes to the flow regime will be long-term and permanent; alteration to flow morphology will be subject to project design mitigation measures and the implementation of reinstatement mitigation measures to avoid downstream effects on the flow regime.

Significance: No adverse effect on Site Integrity due to:

1. In-stream works will only be undertaken during the IFI specified period (July – September) for the Class 1 and Class 2 watercourses (Project Design Mitigation Measure);
2. The Class 1 and Class 2 watercourses where in-stream works are required are mostly small headwater streams;
3. The majority of the watercourses have been in some way altered by the existing landuse (i.e. forestry or agriculture);
4. The limited extent of direct instream works potentially affecting flow, and the sensitive crossing designs to be implemented following consultation with IFI.
5. The brief to temporary duration and reversibility of any effects.
6. The majority (~62%) of the watercourse crossings within the Shannon Catchment are at least 4km upstream of the Lower River Shannon SAC, with ~41% being more than 9km upstream of the SAC.
7. The potential for frac-out during drilling operations is considered low.
8. The Conservation Objectives will not be undermined.

UWF Related Works

Effect Magnitude:
Construction works will take place in close proximity to 6 No. watercourses with fisheries value ((i.e. Class 1 or Class 2 watercourses). Instream works in watercourses with fisheries value will take place at 5 No. watercourse crossing locations, 3 of these crossings relate to temporary trenching works and/or the installation of a temporary crossing structure, while 2 No. relate to cable trenching and the installation of permanent crossing structures.

Significance: No adverse effect on Site Integrity due to:

1. In-stream works will only be undertaken during the IFI specified period (July – September) for the Class 1 and Class 2 watercourses (Project Design Mitigation Measure);
2. The Class 1 and Class 2 watercourses where in-stream works are required are mostly small headwater streams;
3. The majority of the watercourses have been in some way altered by the existing landuse (i.e. forestry or agriculture);
4. The limited extent of direct instream works potentially affecting flow, and the sensitive crossing designs to be implemented in consultation with IFI which will avoid downstream effects to the flow regime.
5. The brief to temporary duration and reversibility of any effects.
6. Only one watercourse crossing (of 32 no. in total part of RW) is within the Shannon Catchment.
7. The Conservation Objectives will not be undermined.

UWF Replacement Forestry- *Screened Out at Stage 1*

Impact Magnitude: No measurable effect on the European Site.

REFERENCE DOCUMENT

Qualifying Interest	**Floating river vegetation (3260)/ Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)** **Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis)** **Otter (Lutra lutra)**
Impact Significance: Not Significant	
Upperchurch Windfarm- Screened Out	
Effect Magnitude: No measurable effect on the European Site.	
Significance: Not Significant	
UWF Other Activities-Screened Out	
Effect Magnitude: No measurable effect on the European Site.	
Impact Significance: Not Significant	
Whole UWF Project **Description of the in combination effect of all five Individual Project Elements together**	
Effect Magnitude: A potential decrease in aquatic habitat (via changes to flow regime) is identified at **20 No**. watercourse crossings where instream works are required within watercourses evaluated as having fisheries value. The spatial extent of such effects will occur within the footprint of the instream works, dispersed between two regional catchments and within several local sub-catchments.	
Whole UWF Project Effect Significance: The effect on European Sites under consideration will **not be significant** due to: 1. The limited extent of direct instream works potentially affecting flow, and the sensitive crossing designs to be implemented following consultation with IFI. Changes to the flow regime may temporarily occur during the crossing works; however, these will be short-term and temporary for the duration of the immediate works. Any temporary alteration to flows or morphology will be reversible and will be subject to seasonal constraints during sensitive aquatic ecology/life stages. 2. The proposed reinstatement works will ensure habitat reinstatement to baseline quality is implemented in order to avoid changes to the flow regime. 3. The majority (~62%) of the watercourse crossings for the UGC within the Shannon Catchment (n=63) are at least 4km upstream of the Lower River Shannon SAC, with ~41% being more than 9km upstream of the SAC. 4. Only one watercourse crossing (of 32 no. in total part of RW) is within the Shannon Catchment. 5. The integrity of neither the site nor the Conservation Objectives will be significant affected.	

Lower River Shannon SAC (002165)

Spread of aquatic invasive species

Table 5.7: Spread of aquatic invasive species

	Floating river vegetation (3260) / Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0) **Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyz-on marinus) Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) Otter (Lutra lutra)**
Project Stage	Construction

Impact Source: Instream works; Excavation works
Impact Pathway: Surface water; Movement of soils and machinery

Impact Description:
Invasive aquatic species include non-native, invasive flora and also fish and invertebrate fauna. Aquatic invasive species may be introduced to unaffected catchments or spread within infected watercourses during the course of instream works or transported via excavation material by site machinery. Aquatic invasive species have the potential for significant ecosystem disturbance, disrupting the predator/prey balance or affecting significant habitat disruption within aquatic and water-dependant systems. The spread of aquatic invasive species is not restricted in extent to the footprint of construction/instream works but can be transported both upstream and downstream within a watercourse, potentially extending throughout the catchment.

Individual Project Elements of the Whole UWF Project
Description of the magnitude and significance of the impact caused by each project element individually

UWF Grid Connection

Effect Magnitude:
There is the potential for introduction of non-native, invasive aquatic species at all watercourse crossings associated with the grid connection works within the Shannon Catchment. Approximately 26.3km of the total 27.5km 110kV UGC is located within the River Shannon Catchment. There are 63 no. watercourse crossings within the River Shannon catchment and in-stream works will be required at 38 no. of these locations.

Impact Significance: No adverse effect on Site Integrity due to:

1. The spread of aquatic invasive species is not restricted in extent to the footprint of the works but can be transported both upstream and downstream within a watercourse. There is the potential for catchment-wide impacts once an introduction has occurred. The incidence of a single, once-off introduction can have lasting, long-term ecosystem effects which can persist beyond any control measures for eradication. In this respect, spread of invasive species is evaluated as non-reversible.
2. The implementation of Best Practice measures which will be a contractual obligation upon any appointed contractor.
3. The majority of the watercourses intercepted by the UWF Grid Connection upstream of the SAC are drains or marginal watercourses which have typically low flows or no flows, and therefore the effectiveness of them acting as surface water flowpaths to the downstream SAC is limited;
4. The majority (~62%) of the watercourse crossings overall within the Shannon Catchment are at least 4km upstream of the Lower River Shannon SAC, with ~41% being more than 9km upstream of the SAC.
5. The Conservation Objectives will not be undermined.

UWF Related Works

Effect Magnitude: Aquatic invasive species may be introduced or to unaffected catchments or spread within infected watercourses during the course of instream works or transported via excavation works by site machinery. The spatial extent of infection arises during construction but can potentially have significant downstream effects which extend throughout the catchment downstream. All watercourses within the works

	Floating river vegetation (3260) / Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0) **Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyz-on marinus) Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) Otter (Lutra lutra)**
area contain highly sensitive aquatic ecology and fisheries receptors downstream. There is the potential for introduction of non-native, invasive aquatic species at 1 No. stream crossings associated with the wind-farm related works.	
Significance: No adverse effect on Site Integrity due to: 1. The low magnitude of possible introduction points into the Shannon system; 2. The implementation of Best Practice measures which will be a contractual obligation upon any appointed contractor. 3. The Conservation Objectives will not be undermined.	
UWF Replacement Forestry –*Screened Out at Stage 1*	
Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1	
Impact Significance: No likelihood of Significant Effect.	
Upperchurch Windfarm – *Screened Out at Stage 1*	
Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1	
Impact Significance: No likelihood of Significant Effect.	
UWF Other Activities –Screened Out	
Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1	
Impact Significance: No likelihood of Significant Effect.	
Whole UWF Project **Description of the in combination effect of all five Individual Project Elements together**	
Effect Magnitude: Aquatic invasive species may be introduced or to unaffected catchments or spread within infected watercourses during the course of instream works or transported via excavation works by site machinery. The spatial extent of infection arises during construction but can potentially have significant downstream effects which extend throughout the catchment downstream. All watercourses within the works area contain highly sensitive aquatic ecology and fisheries receptors downstream. There is the potential for introduction of non-native, invasive aquatic species at stream crossing associated with the consented wind-farm works. The order of effect is essentially the UWF Grid Connection Element.	
Whole UWF Project Impact Significance: No adverse effect on Site Integrity due to: 1. The spread of aquatic invasive species is not restricted in extent to the footprint of the works but can be transported both upstream and downstream within a watercourse. There is the potential for catchment-wide impacts once an introduction has occurred. The incidence of a single, once-off introduction can have lasting, long-term ecosystem effects which can persist beyond any control measures for eradication. In this respect, spread of aquatic invasive species is evaluated as non-reversible. 2. The implementation of Best Practice measures which will be a contractual obligation upon any appointed contractor. 3. The majority of the watercourses intercepted by the UWF Grid Connection upstream of the SAC are drains or marginal watercourses which have typically low flows or no flows, and therefore the effectiveness of these to act as surface water flowpaths to the downstream SAC is limited;	

REFERENCE DOCUMENT

	Floating river vegetation (3260) / Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0) **Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyz-on marinus) Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) Otter (Lutra lutra)**
4. The majority (~62%) of the UGC watercourse crossings overall within the Shannon Catchment are at least 4km upstream of the Lower River Shannon SAC, with ~41% being more than 9km upstream of the SAC. 5. Only a single WC crossing associated with the RW is within the Shannon Catchment. 6. The Conservation Objectives will not be undermined.	

Lower River Shannon SAC (002165)

Decrease in habitat quality via: surface water runoff, sediment entrainment or release; release of fuels oils/ chemicals, surface/ ground water quality impacts

Table-5-8: Decrease in Habitat Quality via: surface water runoff, sediment entrainment or release; release of fuels oils/ chemicals, surface/ ground water quality impacts

Qualifying Interest	**Floating river vegetation (3260)** **Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus) Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis)/ Otter (Lutra lutra)**
Project Stage	Construction

Potential Impact Source Identified: Land Take/Reinstatement/Sediment/Movement of Soils/ Instream Works/Machinery Movement/Excavation Works/Dewatering of excavations/Permanent Access Roads and Hardstanding/Cement based materials/Hydrocarbons/Overburden Storage/Groundworks/ Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)

Impact Pathway: Soils/ Surface Water Flowpaths/ Movement of Soils/ Surface Water

Impact Description:

Aquatic habitat relates to the instream features supporting aquatic biodiversity (bed substrate, morphology, water quality, etc.). Watercourses are highly sensitive to change, containing sensitive aquatic ecological receptors including salmonids, lamprey species, and a diverse macroinvertebrate community. Instream works at some watercourses will require direct excavation of the banks and bed of the watercourse, which can change the physical character of the watercourse and has the potential to degrade the quality of the baseline habitat which supports the structure, function and diversity of aquatic species. Although erosion and deposition are natural process in watercourses, varying naturally throughout the year, additional sediment contributions entering the watercourse, such as from construction works adjacent to or upstream of individual watercourses, can have negative implications for fish and invertebrates due to physical damage and reduced feeding/foraging, as well as negative impacts due to compaction of spawning gravels and mortality impacts for salmonid eggs (affecting recruitment) and invertebrate life stages within gravel substrates (interstitial spaces). These impacts may be mobilised downstream and affect river reaches at a distance from the physical works. In addition, water quality effects due to contamination by fuels, oils or cementitious material has the potential to lead to direct toxicity events, or sub-lethal degradation of aquatic habitat quality.

Individual Project Elements of the Whole UWF Project

Description of the magnitude and significance of the impact caused by each project element individually

UWF Grid Connection

Effect Magnitude:

General Impact Magnitude: Of the 90 No. watercourse crossings along the UWF Grid Connection, 34 No. have been evaluated to have fisheries value. Of these 34 No. watercourses, 15 No. will be subject to instream works (the remaining crossings are over existing crossing structures which do not require any works and cables will be installed either under or over the structure).

The effect on the physical instream habitat i.e. watercourse channel morphology, substrate, and flow character due to instream works has been evaluated as a Slight to Moderate adverse impact on availability, diversity and quality of habitat supporting aquatic species.

Specifically in relation to the Clare River (see cumulative impacts with other Projects below): Approximately 7km of the 110kV UGC exists within the Clare River catchment. Effects on surface water are likely to arise mainly from trench excavation works and watercourse crossings in-stream works. There are 47 no. watercourse crossings (including haulage routes) within the Clare River catchment (W24-W49 and W67-W89).

Specifically in relation to the Newport River: Approximately 8.7km of the 110kV UGC exists within the Newport River catchment (and Small River catchment) including the Mountphilips Substation site. Effects on surface water are likely to arise mainly from trench excavation, watercourse crossings in-stream works and

REFERENCE DOCUMENT

Qualifying Interest	**Floating river vegetation (3260)** **Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus) Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis)/ Otter (Lutra lutra)**

overburden storage. There are 24 No. watercourse crossings (including haulage routes) within the Newport (and Small River) River catchment (W1-W23 and W66).

Impact Significance: No adverse effect on Site Integrity due to:

1. In-stream works will only be undertaken during the IFI specified period (July – September) for the Class 1 and Class 2 watercourses (Project Design Mitigation Measure);
2. The Class 1 and Class 2 watercourses where in-stream works are required are largely small headwater streams and therefore are likely to have relatively low flows during July to September;
3. The in-stream works will not be undertaken without isolation of flow within the watercourse prior to the in-stream works commencing (we refer to outline OCM's as provided in tab 9 of the EMP). This will be completed by over pumping, flume (pipe) or channel diversion methods;
4. There will be no direct discharge of pumped water into the watercourse during the works (we refer to outline OCM's as provided in tab 9 of the EMP);
5. The spatial extent of effects to the watercourse channel will occur within the footprint of the instream works, and;
6. The frequency of such an event is once of for cables trenches with or without new permanent culverts and twice for temporary culverts (once for installation and once for removal), and;
7. The duration of the impact is limited to the specific works period within or adjacent to the aquatic habitat.
8. Impacts to the watercourse channel are temporary and reversible with reinstatement. The duration of any reductions in the quality of downstream habitats due to siltation are considered with regard to fish species, protected Annex II aquatic invertebrates, and macroinvertebrate communities which support fish populations; such effects are evaluated to be temporary to short-term and not reversible.
9. The potential for frac-out during drilling operations is considered low.

Clare River catchment:

1. The majority of the watercourse crossings (32 of 47 no.) within the catchment are drains (Class 3 and Class 4 Watercourse) and therefore the potential for downstream water quality effects is much less due to their low or absent flows;
2. Watercourse crossings at Class 1 and Class 2 watercourses will only be completed between the IFI permitted season of July to September (**Project Design Element);**
3. It's likely only between 100 – 200m of the trench will be excavated in any day with only 1 – 2 watercourse crossings being completed in any one day (assumed 1 -2 work crews); and,
4. The short-term, temporary nature of the works within the catchment;
5. All effects will be brief to temporary in nature and reversible
6. Project design and contingency measures in respect of drilling operations (including those detailed in the EMP and in UWF Grid Connection HDD Risk AssessmentGeoDrilling (Geo Drilling Solutions, 2018) to avoid frac-out), which are located upstream of the SAC.

Newport River catchment

1. The majority of the watercourse crossings within the Small River catchment are drains (Class 4);
2. The majority of the watercourse crossings within the Newport River catchment are streams (Class 1 and Class 2 Watercourse) and therefore works will only be completed between the IFI permitted season of May and September (**Project Design Element);**
3. It's likely only between 200 – 300m of the trench will be excavated in any day with only 2 – 3 watercourse crossings being completed in any one day (assumed 2 – 3 work crews);
4. All effects will be brief to temporary in nature and reversible
5. The majority of the watercourses intercepted by the UWF Grid Connection upstream of the SAC are drains or marginal watercourses which have typically low flows or no flows, and therefore the effectiveness of these to act as surface water flowpaths to the downstream SAC is limited;

Qualifying Interest	**Floating river vegetation (3260)** **Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus) Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis)/ Otter (Lutra lutra)**

6. The majority (~62%) of the UGC watercourse crossings overall within the Shannon Catchment are at least 4km upstream of the Lower River Shannon SAC, with ~41% being more than 9km upstream of the SAC.
7. Project design and contingency measures (including those detailed in the EMP and in GeoDrilling (2018)) in respect of drilling operations at the Mulkear River crossing (located within the SAC but with the crossing to occur within competent fresh bedrock) to avoid frac-out in addition to the unlikely probability of frac-out due to:
   - the small hydrostatic head in the proposed HDD borehole;
   - the five metre depth of cover beneath the river;
   - the high seismic readings recorded in the geophysical survey;
   - the fact the HDD borehole will be predominantly in a competent fresh sandstone, and
   - the drill is relatively short, less than <100 metres in length.

Bilboa River Catchment:

1. Project design and contingency measures (including those detailed in the EMP and in GeoDrilling (2018)) in respect of drilling operations at the Bilboa River crossing (located within the SAC) to avoid frac-out.
2. The Conservation Objectives will not be undermined.

UWF Related Works

Effect Magnitude:
There are 32 no. watercourse crossings required by the Internal Windfarm Cabling, Windfarm Road Realignment and Haul Route Works and in-stream works will be required at 25 no. of these locations. 26 no. of the total 32 no. crossings are located within the Clodiagh River catchment, 5 no. in the Owenbeg catchment and 1 no. in the Bilboa catchment. The latter (in the Bilboa) is the only crossing within the Shannon Catchment.

Significance: No adverse effect on Site Integrity due to:

1. Only a single crossing is located within the Shannon Catchment;
2. Project Design measures in respect of water quality;
3. The implementation of Best Practice measures which will be a contractual obligation upon any appointed contractor;
4. The Conservation Objectives will not be undermined.

UWF Replacement Forestry –*Screened Out at Stage 1*

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Impact Significance: No likelihood of Significant Effect.

Upperchurch Windfarm – *Screened Out at Stage 1*

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Impact Significance: No likelihood of Significant Effect.

UWF Other Activities – *Screened Out at Stage 1*

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Impact Significance: No likelihood of Significant Effect.

REFERENCE DOCUMENT

Qualifying Interest	**Floating river vegetation (3260)** **Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus) Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis)/ Otter (Lutra lutra)**

Whole UWF Project
Description of the in combination effect of all five Individual Project Elements together

Effect Magnitude:
A potential decrease in aquatic habitat quality is identified at watercourse crossings where instream works are required. The order of effect is essentially that of the UWF Grid Connection as only a single crossing as part of the UWF Related Works is located within the Shannon Catchment.

Whole UWF Project Impact Significance: No adverse effect on Site Integrity due to:

1. The implementation of Project Design Measures and Best Practice measures which will be a contractual obligation upon any appointed contractor.
2. The majority of the watercourses intercepted by the UWF Grid Connection (the primary source for significant effects) upstream of the SAC are drains or marginal watercourses which have typically low flows or no flows, and therefore the effectiveness of these to act as surface water flowpaths to the downstream SAC is limited;
3. The majority (~62%) of the UGC watercourse crossings overall within the Shannon Catchment are at least 4km upstream of the Lower River Shannon SAC, with ~42% being more than 9km upstream of the SAC.
4. Only a single WC crossing associated with the RW is within the Shannon Catchment.
5. Project Design measures in respect of drilling operations;
6. The Conservation Objectives will not be undermined.

Lower River Shannon SAC (002165)

Otter: Disturbance to Otter

Table 5-9: Disturbance to Otter

Qualifying Interest:	**Otter**
Project Stage	Construction

Potential Impact Source Identified: Construction Noise and Vibration
Impact Pathway: Ground and Air Vibrations

Impact Description: Otter are rated as a very high sensitivity receptor (based on International importance ratings) and do not tolerate disturbance at or near holts (breeding dens) that are in active use (breeding may occur at any time of the year, but most likely during the period). As no active holts were located within 150m (upstream or downstream) of works locations (i.e. watercourse crossings) then effects are reduced to disturbance/displacement of foraging or resting animals, primarily within aquatic habitats but also within adjacent riparian corridors. This could include the disturbance/displacement of animals at resting places (couches).

These effects are reduced by an adherence to completing works during daylight hours only as part of Project Design. However, watercourses are present which form part of or are hydrologically connected to European Sites (cSAC's) which include Otter as a Qualifying Interest. Significant effects on Otter from displacement resulting from noise or visual intrusion may therefore affect in turn the integrity of these designated site(s).

Individual Project Elements of the Whole UWF Project

Description of the magnitude and significance of the impact caused by each project element individually

UWF Grid Connection

Effect Magnitude:
5 No. watercourse crossings within the Shannon Catchment have been identified as potential sources of disturbance to Otter. A number of sensitive locations, specifically where recorded Otter evidence occurs close to drilling operations at the Mulkear (W10) and Bilboa Rivers (57), cable trenching works at W7 (the Munnia, a tributary of the Newport). In addition, trenching works within 2 existing structures, and the movement of construction traffic over these existing structures along the Reardnogy Beg (at Watercourse Crossings W43, W44) where otter evidence was identified.

The magnitude of source disturbance/stimulus from drilling operations is considered the greater effect in terms of types of watercourse crossings. Although considered unlikely (due to the phased approach being undertaken as part of Project Design for Class 1 and 2 watercourses) the potential exists for sequential effects should animals be displaced and consequently encounter a second source stimulus on a Class 3 or 4 watercourse.

Significance: The effect on European Sites is considered as **likely to be significant** due to

1. The very high sensitivity rating of the species, and direct overlap with the SAC;
2. Recorded Otter evidence in close proximity to the identified crossings, included at SAC crossings, notwithstanding;
3. Works will take place during daylight hours, and;
4. The brief-temporary duration of disturbance events, with
5. Project design measures to avoid/reduce effects also in place , however;
6. Effects may not be reversible., and therefore;
7. Conservation Objectives in respect of Otter may be undermined, and;
8. Site Integrity may possibly be affected.

REFERENCE DOCUMENT

Qualifying Interest:	**Otter**
UWF Related Works- *Screened Out at Stage 1*	
Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1	
Significance: No likelihood of Significant Effect.	
UWF Replacement Forestry-*Screened Out at Stage 1*	
Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1	
Significance: No likelihood of Significant Effect.	
Upperchurch Windfarm -*Screened Out at Stage 1*	
Impact Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1	
Significance: No likelihood of Significant Effect.	
UWF Other Activities-Screened Out	
Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1	
Significance: No likelihood of Significant Effect.	
Whole UWF Project Description of the in combination effect of all five Individual Project Elements together	
Effect Magnitude: Instances of disturbance are limited to 4 no. watercourse crossing locations along the UWF Grid Connection, 2 of which involve drilling operations at rivers designated as part of the Lower River Shannon for Otter. As no holts or resting places were recorded, and works will take place during daylight hours only as part of project design, effects are reduced. Overall, the whole project effect is considered in the order of the UWF Grid Connection element.	
Significance: The effect on European Sites is considered as **likely to be significant** due to 1. Evidence of animals in close proximity to watercourse crossing locations was recorded, in particular on the Mulkear, Bilboa and Munnia Rivers, and Otter may possibly utilise additional watercourses; 2. Works will involve drilling operations, and; 3. Works will take place during daylight hours only which ameliorates effects, and; 4. No holts were identified within 150m of the construction works boundary, and; 5. Any effect is temporary with the total duration of e.g. trenching and ducting expected to be 16-18 weeks; 6. Effects may not be reversible given the sensitivity of the species, and if this occurs; 7. Conservation Objectives in respect of Distribution and / or maintenance of a riparian buffer (possibly undermined by avoidance) may be impinged upon.	

Lower River Suir SAC (002137)

Riparian Habitat Degradation

Table 5-10: Riparian Habitat Degradation

Qualifying Interest	Floating river vegetation (3260) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*) / Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)
Project Stage	Construction/Operation (maintenance and surface water runoff)

Potential Impact Source Identified: Land Take/Reinstatement/Sediment/Movement of Soils/Instream Works/Machinery Movement/Excavation Works/Dewatering of excavations/Permanent Access Roads and Hardstanding/Cement based materials/Hydrocarbons/Overburden Storage/Groundworks
Impact Pathway: Soils; Direct Contact

Effect Description: The riparian corridor along a watercourse relates to the interface between the aquatic habitat, the bankside vegetation and terrestrial environment. An intact, semi-natural riparian zone has significant beneficial services in the protection of instream aquatic habitat quality, food/nutrient contributions, and temperature regulation. Existing riparian habitat quality within the study area is subject to afforestation and agricultural management, including clearance works, drainage maintenance and channelization works.

The removal of, or damage to, riparian vegetation during instream works or excavation/ground clearance works in close proximity to any watercourse has the potential to impact on the quality of riparian habitats which in turn can affect watercourse morphology, shading, bank stability, and nutrient and sediment loading and result in indirect effects on aquatic and water-dependant habitats and species within direct proximity of the works and downstream.

Project design: Following works at or in close proximity to watercourses (Class 1 or Class 2), reinstatement works will be carried out which will include site-specific bank stabilisation measures using boulder armour or willow/brush bank protection; reinstatement of bank slope and character; creation of compound channels where necessary; and replanting of riparian buffer zones with suitable native species to manage flood flows and buffer run-off.

Individual Project Elements of the Whole UWF Project

Description of the magnitude and significance of the impact caused by each project element individually

Element 1: UWF Grid Connection

Effect Magnitude:

Within the River Suir catchment, the last c.1.2km of the 110kV UGC route is located within the Clodiagh River local surface water body. This will require 1 no. compound, 1 no. joint bay and mainly temporary access roads in addition to the trench; there are no proposed temporary or permanent overburden storage areas required for the UWF Grid Connection within the River Suir catchment. The UWF Grid Connection construction works are located at least 12km upstream of the River Suir SAC within the Clodiagh sub-catchment. From a total of 90 No. watercourse crossings within the construction works area boundary associated with the UWF Grid Connection, riparian habitat within two crossing locations will be affected at **2 No.** watercourse crossing locations within the River Suir regional catchment (crossings W64 and W65). Both watercourses are evaluated as having no fisheries value, characterised as drainage channels.

The duration of any loss of well-structured riparian habitat impacts is evaluated with regard to the direct aquatic habitat services provided by the riparian zone (bank stabilization and erosion control, shading and temperature regulation), as well as the indirect inputs such as habitat for invertebrate food for fish and aquatic biota, reduction in light for aquatic flora, flood control and buffering effects in relation to run-off.

Qualifying Interest	Floating river vegetation (3260) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*) / Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)

Riparian habitat impacts will be reversible with reinstatement and will be temporary to short-term, limited to the construction phase and early operational stage until vegetation has re-established.

Significance: No adverse effect on Site Integrity due to:

1. The limited extent of instream works, within defined works areas, will reduce the potential spatial area.
2. Existing riparian habitat quality within the proposed works areas is subject to afforestation and agricultural management, including clearance works, drainage maintenance and channelization works.
3. Riparian habitat impacts will be limited to the construction phase, reversible, temporary and short-term and in line with baseline conditions.
4. Riparian habitat impacts are to be managed with project reinstatement measures (Project Design Mitigation Measures) and is therefore reversible;
5. Bank works are required at stream crossing locations; alternatives to riparian clearance are not available.
6. All UWF Grid Connection works are located a minimum of 12km upstream of the Lower Suir SAC site boundary on the Clodiagh (Tipperary) River.

Element 2: UWF Related Works

Effect Magnitude:
The majority of the footprint of the UWF Related Works is located within the River Suir regional catchment; mainly in the Clodiagh (Tipperary) River sub-catchment, with the remainder within the Turraheen River (Multeen East), and Owenbeg River sub-catchments. Of the total 17.9km of internal windfarm cabling, 16.2km is located within the River Suir catchment. In terms of the watercourse crossings associated with the UWF Related Works, **31 no.** of the total 32 no. are located within the River Suir catchment. Of the 31 no. watercourse crossings within the River Suir catchment, 26 no. are at least 12km upstream (Clodiagh (Tipperary) River catchment) of the Lower River Suir SAC and the remaining 5 no. are at least 3km upstream of the SAC (Owenbeg River catchment).

The duration of any loss of well-structured riparian habitat impacts is evaluated with regard to the direct aquatic habitat services provided by the riparian zone (bank stabilization and erosion control, shading and temperature regulation), as well as the indirect inputs such as habitat for invertebrate food for fish and aquatic biota, reduction in light for aquatic flora, flood control and buffering effects in relation to run-off. Riparian habitat impacts will reversible with reinstatement and will be temporary to short-term, limited to the construction phase and early operational stage until vegetation has re-established.

Significance: No adverse effect on Site Integrity due to:

1. Riparian habitat impacts that may affect aquatic ecology and fisheries receptors are limited to discrete locations at watercourse crossing locations within minor watercourses;
2. The general context of the watercourses affected comprises managed agricultural lands and open uplands with poorly-developed riparian habitat, where well-developed riparian habitat occurs it comprises willow species which regenerate quickly;
3. Riparian habitat impacts are to be managed with project reinstatement measures (Project Design Mitigation Measures) and is therefore reversible;
4. Riparian habitat impacts will be limited to the construction phase, reversible, temporary and short-term and in line with baseline conditions. Bank works are required at stream crossing locations; alternatives to riparian clearance are not available.
5. Impacts to the riparian habitat are temporary to short-term and reversible with reinstatement.

Qualifying Interest	Floating river vegetation (3260) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*) / Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)

6. No works are required within the Lower Suir SAC boundary, the closest stream crossings are on the Owenbeg river at least 3km upstream of the SAC boundary.

Element 3: UWF Replacement Forestry – *Screened Out at Stage 1*

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Significance: No Liklihood of Significant Effect

Element 4: Upperchurch Windfarm – *Screened Out at Stage 1*

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Significance: No Liklihood of Significant Effect

Element 5: UWF Other Activities

Effect Magnitude: There are no watercourse crossing works proposed in relation to the UWF Other Activities within the River Suir catchment; however, such activities are located within the upper Clodiagh and upper Multeen sub-catchments. Indirect impacts affecting riparian habitat are limited to surface water run-off and pollution events which may occur via surface flow pathways.

Significance: No adverse effect on Site Integrity due to:

1. Riparian habitat impacts that may affect aquatic ecology and fisheries receptors are limited, with no watercourse crossings required during the UWF Other Activities;
2. The general context of the lands affected comprises managed agricultural lands and open uplands with poorly-developed riparian habitat, where well-developed riparian habitat occurs within the wider works area it comprises willow species which regenerate quickly;
3. Riparian habitat impacts are to be managed with project water quality management measures (Project Design Mitigation Measures) and is therefore reversible;
4. Any riparian habitat impacts will be limited to the construction phase, reversible, temporary and short-term and in line with baseline conditions.
5. Impacts to the riparian habitat are temporary to short-term and reversible with reinstatement.

Whole UWF Project

Description of the in-combination effect of all five Individual Project Elements together

Effect Magnitude:

Riparian habitat will be affected at a total of **31 No**. watercourse crossings within the Suir catchment, including the upper Clodiagh, Turraheen (Multeen East) and Owenbeg rivers. There are no instream works or works within the riparian zone required within or directly adjacent to the Lower Suir SAC. The effect on the riparian and bankside habitat with implications for the structure and function of the habitat services with regard to aquatic ecological receptors has been evaluated as not significant in the context of the integrity of the European Site and its respective Conservation Objectives. Instream works potentially affecting riparian habitat will be at a distance of 12km from the SAC boundary in the Clodiagh (Tipperary) catchment, and at least 3km from the SAC boundary in the Owenbeg catchment.

The potential for downstream impacts indirectly affecting riparian habitat within the SAC are evaluated as being limited to potential siltation or water quality impacts via surface water pathways.

The spatial extent of such effects will occur within the footprint of the instream works, with the potential for direct impacts at the approach to watercourse crossing works areas.

REFERENCE DOCUMENT

Qualifying Interest	Floating river vegetation (3260) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*) / Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)

Significance: No adverse effect on Site Integrity due to:

1. The watercourse crossing works required for the UWF Grid Connection are largely located within the River Shannon catchment while the watercourse crossings required for the Upperchurch Windfarm and UWF Related Works are largely located in the River Suir surface water catchment. 2 no. crossings are required in the Suir catchment during the UWF Grid Connection component, with 29 no. required during Related Works; the potential for downstream effects are identified with regard to the UWF Grid Connection, UWF Related Works and UWF Related Activities. The significance of effects is considered with regard to the size and scale of the works proposed and the distance of separation from the sensitive riparian habitat receptors.
2. The limited extent of instream works, within defined works areas will reduce the potential spatial area.
3. The Class 1 and Class 2 watercourses where in-stream works are required are largely small headwater streams and therefore are likely to have relatively low flows during July to September;
4. Existing riparian habitat quality within the proposed works areas is subject to afforestation and agricultural management, including clearance works, drainage maintenance and channelization works.
5. Riparian habitat impacts will be limited to the construction phase, reversible, temporary and short-term and in line with baseline conditions. Bank works are required at stream crossing locations; alternatives to riparian clearance are not available
6. The duration of the impact is evaluated with regard to the aquatic habitat services and buffering effects provided by riparian habitats at each discrete works location. Such impacts are limited to the specific works location and do not interact with riparian habitat communities within the watercourse as a whole, or at a catchment level, in view of cumulative or synergistic project effects. Riparian habitat impacts are once-off, restricted to the period of works within or adjacent to the aquatic habitat and are thus not subject to sequential project effects.
7. Riparian habitat impacts are to be managed with project reinstatement measures (Project Design Mitigation Measures) and is therefore reversible;
8. Impacts to the riparian habitat are temporary to short-term and reversible with reinstatement.
9. No works are proposed within or adjacent to the Lower River Suir SAC. The closest connectivity to the site boundary is on the Owenbeg River, where the SAC is at least 3km downstream of the Windfarm Related Works.

Lower River Suir SAC (002137)

Disturbance to/ or Displacement of Aquatic Species

Table 5-11: Disturbance to/ or Displacement of Aquatic Species

Qualifying Interest	Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) / White-clawed Crayfish (Austropotamobius pallipes) / Freshwater pearl mussel (Margaritifera margaritifera)
Project Stage	Construction

Potential Impact Source Identified: Reinstatement/Sediment/Instream Works/Machinery Movement/Excavation Works/Dewatering of excavations/Groundworks
Impact Pathway: Surface water; Direct contact; Ground and air vibrations

Impact Description:
Instream works and machinery operation within or in close proximity to any watercourse has the potential to directly disturb or displace salmonid fish and aquatic species within fish-bearing streams, or sensitive aquatic receptors Fish are likely to mobilise outside of their territories due to human disturbance but will return once the disturbance effect diminishes. Aquatic invertebrates are less sensitive to disturbance and displacement arising from human activity and are scoped out from evaluation of disturbance/displacement effects. The extent of disturbance or displacement of aquatic ecological receptors, including fish, may occur due to the direct footprint of any instream works within watercourses which support anadromous Atlantic salmon, lamprey species, or White-clawed crayfish upstream of and indirectly connected to the SAC population. Additional disturbance effects may occur downstream due to transport of silt or pollutants which would elicit an avoidance response in any of the Annex II species listed above. Disturbance or displacement effects will be brief to temporary in nature, lasting for the duration of individual works elements.

Individual Project Elements of the Whole UWF Project

Description of the magnitude and significance of the impact caused by each project element individually

UWF Grid Connection

Effect Magnitude:

Within the River Suir catchment, the last c.1.2km of the 110kV UGC route is located within the Clodiagh (Tipperary) River local surface water body. This will require 1 no. compound, 1 no. joint bay and mainly temporary access roads in addition to the trench; there are no proposed temporary or permanent overburden storage areas required for the UWF Grid Connection within the River Suir catchment. The UWF Grid Connection construction works are located at least 12km upstream of the River Suir SAC within the Clodiagh (Tipperary) sub-catchment. From a total of 90 No. watercourse crossings within the construction works area boundary associated with the UWF Grid Connection, riparian habitat within two crossing locations will be affected at **2 No.** watercourse crossing locations within the River Suir regional catchment (crossings W64 and W65). Both watercourses are evaluated as having no fisheries value, characterised as drainage channels.

Any Annex II species (White-clawed crayfish, Atlantic salmon, brook lamprey) which occur downstream within these watercourses, are likely to be affected during the instream works duration only due to works activities. The frequency of these disturbance effects is once for cables trenches with or without new permanent culverts and twice for temporary culverts (once for installation and once for removal); however, any such potential disturbance is limited to downstream influences arising due to water quality effects. There will be no direct disturbance of Annex II species *ex situ* the SAC within the watercourses crossed by the UWF Grid Connection.

The remaining crossings are over existing crossing structures which do not require any works and cables will be installed either under or over the structure, disturbance effects at these locations are Imperceptible.

Qualifying Interest	Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) / White-clawed Crayfish (Austropotamobius pallipes) / Freshwater pearl mussel (Margaritifera margaritifera)

Significance: No adverse effect on Site Integrity due to:

1. In-stream works will only be undertaken during the IFI specified period (July – September) for the watercourses with fisheries value (Class 1 and Class 2 watercourses) to avoid sensitive salmonid instream migration and spawning periods (Project Design Mitigation Measure). However, streams to be crossed within the Suir catchment do not have any fisheries value, characterized as drainage channels;
2. The minor watercourses where in-stream works are required are drainage channels / headwater streams and therefore are likely to have relatively low flows during July to September;
3. The in-stream works will not be undertaken without isolation of flow within the watercourse prior to the in-stream works commencing (Project Design Mitigation Measure);
4. There will be no direct discharge of pumped water into the watercourse during the works (we refer to outline construction methodologies in the EMP for UWF Grid Connection);
5. The extent of disturbance or displacement of aquatic ecological receptors, including fish, will be limited to the direct footprint of any instream works within watercourses which support anadromous Atlantic salmon and resident Brown trout populations. Additional disturbance effects will occur at the three river crossings, where the 110kV UGC will be installed using drilling techniques, where disturbance effects within the watercourse channel will be limited to the spatial extent of drilling activities.
6. The duration of any disturbance impacts are considered with regard to the distance of separation and the magnitude of potential effects on fish species, protected Annex II aquatic invertebrates, and macroinvertebrate communities which support fish populations; such effects are evaluated to be temporary and reversible.
7. All UWF Grid Connection works are located a minimum of 12km upstream of the Lower Suir SAC site boundary on the Clodiagh (Tipperary) River.
8. The Conservation Objectives will not be undermined.

UWF Related Works

Effect Magnitude:
The majority of the footprint of the UWF Related Works is located within the River Suir regional catchment; mainly in the Clodiagh (Tipperary) River sub-catchment, with the remainder within the Turraheen River (Multeen East), and Owenbeg River sub-catchments. Of the total 17.9km of internal windfarm cabling, 16.2km is located within the River Suir catchment. In terms of the watercourse crossings associated with the UWF Related Works, **31 no.** of the total 32 no. are located within the River Suir catchment. Of the 31 no. watercourse crossings within the River Suir catchment, 26 no. are at least 12km upstream (Clodiagh (Tipperary) River catchment) of the Lower River Suir SAC and the remaining 5 no. are at least 3km upstream of the SAC (Owenbeg River catchment).

Where White-clawed crayfish, Atlantic salmon or brook lamprey may be present *ex situ* and upstream of the SAC boundary, any instream effects will be limited to a short (1-2 day period) during instream works. The frequency of these disturbance effects is once for cables trenches with or without new permanent culverts and twice for temporary culverts (once for installation and once for removal). Potential effects on the Annex II species listed as qualifying interests of the SAC, within the SAC boundary, are limited to potential indirect impacts arising from water quality effects resulting in disturbance or aversion behaviours.

Significance: No adverse effect on Site Integrity due to:

1. In-stream works will only be undertaken during the IFI specified period (July – September) for watercourse supporting fish habitat (Class 1 and Class 2 watercourses) to avoid sensitive salmonid and lamprey instream migration and spawning periods (Project Design (PD) Mitigation Measure);
2. The Class 1 and Class 2 watercourses where in-stream works are required are largely small headwater streams and therefore are likely to have relatively low flows during July to September;

Qualifying Interest	Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) / White-clawed Crayfish (Austropotamobius pallipes) / Freshwater pearl mussel (Margaritifera margaritifera)

3. The in-stream works will not be undertaken without isolation of flow within the watercourse prior to the in-stream works commencing (Project Design Measure);
4. There will be no direct discharge of pumped water into affected watercourses during the works (Project Design Measure);
5. The singular frequency of any disturbance events at trench works and permanent culvert locations;
6. The duration of any disturbance impacts are considered with regard to the distance of separation, the scale and extent of works upstream of the SAC, the potential connectivity to Atlantic salmon and lamprey populations *ex situ* the SAC, protected Annex II aquatic invertebrates, and macroinvertebrate communities which support fish populations; such effects are evaluated to be temporary and reversible.
7. No works are required within the Lower Suir SAC boundary, the closest stream crossings are on the Owenbeg river at least 3km upstream of the SAC boundary.
8. The Conservation Objectives will not be undermined.

UWF Replacement Forestry- *Screened Out at Stage 1*

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Significance: No likelihood of Significant Effect

Upperchurch Windfarm - *Screened Out at Stage 1*

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Significance: No likelihood of Significant Effect

UWF Other Activities

Effect Magnitude:
There are no watercourse crossing works proposed in relation to the UWF Other Activities within the River Suir catchment; however, such activities are located within the upper Clodiagh (Tipperary) and upper Multeen sub-catchments. Indirect impacts affecting land use within these drainage catchments give rise to surface water flowpaths which have the potential for surface water run-off and pollution events which may result in disturbance or avoidance responses within the SAC downstream.

Significance: No adverse effect on Site Integrity due to:

1. No instream works are required arising from the UWF other activities;
2. The watercourses within the vicinity of the UWF Other Activities are largely small headwater streams and therefore are likely to have relatively low flows during the prescribed construction window, July to September;
3. There will be no direct discharge of pumped water into any watercourse during the works (Project Design Measure). No dewatering / water generating activities required;
4. The duration of any disturbance impacts are considered with regard to fish species, protected Annex II aquatic invertebrates, and macroinvertebrate communities which support fish populations; such effects are evaluated to be temporary and reversible and located at a significant distance upstream of the SAC boundary, with further cognizance of the scale and nature of the activities proposed.
5. Although UWF Other Activities are required within the Lower River Suir SAC boundary (HA19), the closest proximity is roadside trimming located c.20m from the main channel of the river. This will not disturb Aquatic Ecology.
6. The Conservation Objectives will not be undermined.

Whole UWF Project
Description of the in-combination effect of all five Individual Project Elements together

REFERENCE DOCUMENT

Qualifying Interest	Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) / White-clawed Crayfish (Austropotamobius pallipes) / Freshwater pearl mussel (Margaritifera margaritifera)

Effect Magnitude:

Direct disturbance or displacement of aquatic ecological receptors, including fish, will be limited to the footprint of any instream works and directly upstream and downstream of all crossings, temporary and permanent instream works structures and bank-side works. At the local level in the context of individual receptors, temporary displacement will be limited to the affected stretch of watercourse, without cumulative population-level impacts at a watercourse or catchment level; with cognisance of the distance of separation to the SAC boundary downstream. Additional disturbance effects within the watercourse channel will be limited to the spatial extent of any water quality effects extending downstream which may result in disturbance or avoidance behaviours in the Annex II receptors.

Significance: No adverse effect on Site Integrity due to:

1. In-stream works will only be undertaken during the IFI specified period (July – September) for watercourses identified as having fisheries value (Class 1 and Class 2 watercourses) to avoid sensitive salmonid and lamprey instream migration and spawning periods (Project Design Mitigation Measure);
2. The Class 1 and Class 2 watercourses where in-stream works are required are largely small headwater streams and therefore are likely to have relatively low flows during July to September (Project Design Mitigation Measure);
3. Any in-stream works will not be undertaken without isolation of flow within the watercourse prior to the in-stream works commencing (Project Design Mitigation Measure);
4. There will be no direct discharge of pumped water into the watercourse during the works (Project Design Mitigation Measure);
5. The duration of any disturbance impacts are considered with regard to fish species, protected Annex II aquatic invertebrates, and macroinvertebrate communities which support Annex II fish populations; such effects are evaluated to be temporary and reversible within the footprint of the works area, outside of and at a significant distance upstream of the SAC boundary.
6. No works are required within the Lower Suir SAC boundary, the closest stream crossings are on the Owenbeg river are at least 3km upstream of the SAC boundary and within the Clodiagh (Tipperary) River, at least 12km upstream of the SAC boundary.
7. The Conservation Objectives will not be undermined.

Lower River Suir SAC (002137)

Changes in Flow Regime

Table 5.12: Changes in Flow Regime

Qualifying Interest	Floating river vegetation (3260)/ Alluvial forests (91E0) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*)/ Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)
Project Stage	Construction

Potential Impact Source Identified: Sediment; Instream works; Machinery movement;
Impact Pathway: Soils/Surface Water andGroundWater Flowpaths/Landcover/Direct Contact

Impact Description:
Watercourse morphology relates to the shape of a watercourse channel, its bed and banks and how erosion, transportation of water, sedimentation and the composition of riparian vegetation changes this shape over time. Direct impacts are identified to channel morphology and geomorphology (bed and banks of watercourses) due to instream works and sediment deposition. Aquatic species, which are likely to be present in fishery value watercourses at instream construction works locations, are reliant on instream habitat heterogeneity (riffle/glide/pool structure); along with the availability of peak flow flushes (flood/spate); the provision of flows for upstream/downstream migration (impassable barriers); and avoidance of channel constriction during low flow. Any change in watercourse morphology which affects channel flow regimes can result in cross factor effects on aquatic ecological communities and water-dependant habitats, which are likely to be present in fishery value watercourses at instream construction works locations. These communities are reliant on instream habitat heterogeneity (riffle/glide/pool structure); along with the availability of peak flow flushes (flood/spate); the provision of flows for upstream/downstream migration (impassable barriers); and avoidance of channel constriction during low flow.

Instream works are limited to the individual crossing points and include trenching works for underground cables, installation of temporary or permanent crossing structures and reinstatement works. The reinstatement works will maintain the channel morphology, in line with IFI (2016) and will include site-specific bank stabilisation measures using boulder armour or willow/brush bank protection; reinstatement of bank slope and character; creation of compound channels where necessary; and reinstatement of instream flow features such as boulder substrates, pool / riffle sequences, or spawning cobbles. The creation of adverse flow conditions or habitat limitations due to changes to flow or morphology will be limited to the specific works period within or adjacent to the aquatic habitat.

Project Design Mitigation Measures include the use of culverts at all new permanent watercourse crossings which will be a minimum of 900mm in diameter and will be bottomless or clear spanning on all Class 1 and Class 2 type watercourse and the use of reinstatement of the banks and beds at crossing locations. In addition in-stream works will only be undertaken during the IFI specified period (July – September) for the Class 1 and Class 2 watercourses (Project Design Mitigation Measure).

Individual Project Elements of the Whole UWF Project
Description of the magnitude and significance of the impact caused by each project element individually

UWF Grid Connection

Effect Magnitude:

Within the River Suir catchment, the last c.1.2km of the 110kV UGC route is located within the Clodiagh (Tipperary) River local surface water body. This will require 1 no. compound, 1 no. joint bay and mainly temporary access roads in addition to the trench; there are no proposed temporary or permanent overburden storage areas required for the UWF Grid Connection within the River Suir catchment. The UWF Grid Connection construction works are located at least 12km upstream of the River Suir SAC within the Clodiagh (Tipperary) sub-catchment. From a total of 90 No. watercourse crossings within the construction works area

Qualifying Interest	Floating river vegetation (3260)/ Alluvial forests (91E0) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*)/ Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)

boundary associated with the UWF Grid Connection, riparian habitat within two crossing locations will be affected at **2 No.** watercourse crossing locations within the River Suir regional catchment (crossings W64 and W65). Both watercourses are evaluated as having no fisheries value, characterised as drainage channels.

At the 2 no. crossing points, changes to the flow regime will be brief to temporary and for the duration of the immediate works. Any temporary alteration to flows or morphology will be reversible and will be subject to seasonal constraints during sensitive aquatic species life stages (project design mitigation measure). Any alteration to flow morphology will be subject to project design mitigation measures and the implementation of reinstatement mitigation measures to avoid downstream effects on the flow regime.

Significance: No adverse effect on Site Integrity due to:

1. In-stream works will only be undertaken during the IFI specified period (July – September) for watercourses with fisheries value (Class 1 and Class 2 watercourses) following Project Design Mitigation Measures. However, the affected watercourses within the UWF Grid Connection works area are identified as having no fisheries value and are characterized as drainage channels;
2. The majority of the watercourses within the wider study area have been in some way altered by the existing landuse (i.e. forestry or agriculture);
3. The limited extent of direct instream works potentially affecting flow, and the sensitive crossing designs to be implemented in line with consultation with IFI.
4. The brief to temporary duration and reversibility of any effects.
5. All UWF Grid Connection works are located a minimum of 12km upstream of the Lower Suir SAC site boundary on the Clodiagh River.
6. The Conservation Objectives will not be undermined.

UWF Related Works

Effect Magnitude:
The majority of the footprint of the UWF Related Works is located within the River Suir regional catchment; mainly in the Clodiagh (Tipperary) River sub-catchment, with the remainder within the Turraheen River (Multeen East), and Owenbeg River sub-catchments. Of the total 17.9km of internal windfarm cabling, 16.2km is located within the River Suir catchment. In terms of the watercourse crossings associated with the UWF Related Works, 31 no. of the total 32 no. are located within the River Suir catchment. Of the 31 no. watercourse crossings within the River Suir catchment, 26 no. are at least 12km upstream (Clodiagh (Tipperary) River catchment) of the Lower River Suir SAC and the remaining 5 no. are at least 3km upstream of the SAC (Owenbeg River catchment).

The potential for changes in the flow regime at the proposed watercourse crossings is evaluated with reference to the distance of separation between the work sites and the downstream SAC boundary, and also with regard to the small size and character of the headwater contributing streams affected by the proposed works.

Significance: No adverse effect on Site Integrity due to:

1. In-stream works will only be undertaken during the IFI specified period (July – September) for watercourses identified as having fisheries value (Class 1 and Class 2 watercourses) following Project Design Mitigation Measures. These will be implemented with regard to the seasonal movements of Atlantic salmon and lamprey species and their sensitive spawning periods;
2. The Class 1 and Class 2 watercourses where in-stream works are required are mostly small headwater streams;

Qualifying Interest	Floating river vegetation (3260)/ Alluvial forests (91E0) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*)/ Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)

3. The majority of the watercourses have been in some way altered by the existing landuse (i.e. forestry or agriculture);
4. The limited extent of direct instream works potentially affecting flow, and the sensitive crossing designs to be implemented following requirements set out by IFI, will avoid downstream effects to the flow regime.
5. The brief to temporary duration and reversibility of any effects.
6. No works are required within the Lower Suir SAC boundary, the closest stream crossings are on the Owenbeg river at least 3km upstream of the SAC boundary.
7. The the Conservation Objectives will not be undermined.

UWF Replacement Forestry- *Screened Out at Stage 1*

Impact Magnitude: : Potential for adverse effect excluded – Screened Out at Stage 1

Impact Significance: No Likelihood of Significant Effect

Upperchurch Windfarm- *Screened Out at Stage 1*

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Significance: No Likelihood of Significant Effect

UWF Other Activities

Effect Magnitude:
There are no watercourse crossing works proposed in relation to the UWF Other Activities within the River Suir catchment; however, such activities are located within the upper Clodiagh (Tipperary) and upper Multeen sub-catchments. Indirect impacts affecting riparian habitat are limited to surface water run-off and pollution events which may occur via surface flow pathways.

Significance: No adverse effect on Site Integrity due to:

1. No instream works are required arising from the UWF other activities;
2. The watercourses within the vicinity of the UWF Other Activities are largely small headwater streams and therefore are likely to have relatively low flows;
3. There will be no bank works or riparian habitat disturbance required during the proposed activities;
4. The duration of any works activities are considered with regard to fish species, protected Annex II aquatic invertebrates, and macroinvertebrate communities which support fish populations; such effects on flow contributions within the upper Clodiagh (Tipperary) and Multeen sub-catchments are evaluated to be temporary and reversible and located at a significant distance upstream of the SAC boundary, with further cognizance of the scale and nature of the activities proposed.
5. Although Activities are required within the Lower River Suir SAC boundary (HA19), the closest proximity is roadside trimming located c.20m from the main channel of the river. This will not affect flow regime due to the nature of the roadside activities, which precludes effects on the nearby river.
6. The Conservation Objectives will not be undermined.

REFERENCE DOCUMENT

Qualifying Interest	Floating river vegetation (3260)/ Alluvial forests (91E0) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*)/ Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)

Whole UWF Project

Description of the in combination effect of all five Individual Project Elements together

Effect Magnitude:

A potential decrease in aquatic habitat (via changes to flow regime) is identified at **31 No**. watercourse crossings where instream works are required within watercourses located within headwater streams of the Suir catchment. The spatial extent of such effects will occur within the footprint of the instream works, dispersed within several local sub-catchments and all of which are at a significant distance upstream of the SAC site boundary.

Whole UWF Project Effect Significance: No adverse effect on Site Integrity due to:

1. The limited extent of direct instream works potentially affecting flow, and the sensitive crossing designs to be implemented in line with requirements specified by IFI. Changes to the flow regime may temporarily occur during the crossing works; however, these will be short-term and temporary for the duration of the immediate works. Any temporary alteration to flows or morphology will be reversible and will be subject to seasonal constraints avoiding the sensitive aquatic ecology/life stages of Annex II species which may occur *ex situ* the SAC site boundary.
2. The proposed reinstatement works will ensure habitat reinstatement to baseline quality is implemented in order to avoid changes to the flow regime within the receiving waters downstream of the affected headwater streams; this will negate the potential for changes to the flow regime or morphology of the river catchments designated within the Lower River Suir SAC i.e. the Multeen, Owenbeg and Clodiagh (Tipperary) sub-catchments.
3. No works are proposed within or adjacent to the Lower River Suir SAC. The closest connectivity to the site boundary is on the Owenbeg River, where the SAC is at least 3km downstream and at 12km downstream on the Clodiagh (Tipperary) River.
4. The Conservation Objectives will not be undermined.

Lower River Suir SAC (002137)

Spread of Aquatic Invasive Species

Table 5.13: Spread of Aquatic Invasive Species

Qualifying Interest	Floating river vegetation (3260) / Alluvial forests (91E0) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*)/ Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)
Project Stage	Construction

Potential Impact Source Identified: Movement of soils/Instream Works/Machinery Movement
Impact Pathway: Surface Water

Impact Description:
Invasive aquatic species include non-native, invasive flora and also fish and invertebrate fauna (Invasive Alien Species; IAS). Aquatic invasive species may be introduced to unaffected catchments or spread within infected watercourses during the course of instream works or transported via excavation material by site machinery. Aquatic invasive species have the potential for significant ecosystem disturbance, disrupting the predator/prey balance or affecting significant habitat disruption within aquatic and water-dependant systems. The spread of aquatic invasive species is not restricted in extent to the footprint of construction/instream works but can be transported both upstream and downstream within a watercourse, potentially extending throughout the catchment.

There is the potential for catchment-wide impacts once an introduction has occurred. The incidence of a single, once-off introduction can have lasting, long-term ecosystem effects which can persist beyond any control measures for eradication. In this respect, spread of invasive species is evaluated as non-reversible.

Individual Project Elements of the Whole UWF Project
Description of the magnitude and significance of the impact caused by each project element individually

UWF Grid Connection

Effect Magnitude:
There is the potential for introduction of non-native, invasive aquatic species at **2 no.** watercourse crossings associated with the grid connection works within the Clodiagh (Tipperary) sub-catchment. The final c.1.2km of the 110kV UGC route is located within the Clodiagh (Tipperary) River local surface water body, within the Suir catchment. These watercourses are identified as having no fisheries values, being characterised as drainage channels (W64 and W65); both of which are located approximately 12km upstream of the Lower River Suir SAC boundary on the Clodiagh (Tipperary) River main channel. As such the introduction and spread of non-native, invasive species would have the potential to extend within these minor headwater streams with connectivity to the SAC on the Clodiagh main channel downstream.

Impact Significance: No adverse effect on Site Integrity due to:

1. The implementation of Best Practice measures which will be a contractual obligation upon any appointed contractor, which include specific biosecurity measures for the prevention of IAS introduction (including Crayfish Plague) and spread.
2. The minor watercourses intercepted by the UWF Grid Connection upstream of the SAC are drains which have typically low flows or no flows, and therefore the effectiveness of them acting as surface water flowpaths to the downstream SAC is limited;
3. The watercourse crossings within the Clodiagh (Tipperary) catchment are approximately 12km upstream of the Lower River Suir SAC.
4. The Conservation Objectives will not be undermined.

Qualifying Interest	Floating river vegetation (3260) / Alluvial forests (91E0) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*)/ Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)

UWF Related Works

Effect Magnitude: Aquatic invasive species may be introduced to unaffected catchments or spread within infected watercourses during the course of instream works or transported via excavation works by site machinery. The spatial extent of infection arises during construction but can potentially have significant downstream effects which extend throughout the catchment downstream. The majority of the footprint of the UWF Related Works is located within the River Suir regional catchment; mainly in the Clodiagh (Tipperary) River sub-catchment, with the remainder within the Turraheen River (Multeen East), and Owenbeg River sub-catchments. Of the total 17.9km of internal windfarm cabling, 16.2km is located within the River Suir catchment. In terms of the watercourse crossings associated with the UWF Related Works, 31 no. of the total 32 no. are located within the River Suir catchment. Of the 31 no. watercourse crossings within the River Suir catchment, 26 no. are at least 12km upstream (Clodiagh (Tipperary) River catchment) of the Lower River Suir SAC and the remaining 5 no. are at least 3km upstream of the SAC (Owenbeg River catchment).
All watercourses within the works area contain highly sensitive aquatic ecology and fisheries receptors with connectivity to the SAC downstream.

Significance: No adverse effect on Site Integrity due to:

1. The implementation of Best Practice measures which will be a contractual obligation upon any appointed contractor, which include specific biosecurity measures for the prevention of IAS introduction (including Crayfish Plague) and spread.
2. The low magnitude of direct instream works required within the minor watercourses identified as the upper reaches of the Clodiagh (Tipperary) , Owenbeg, and Turraheen (Multeen East) Rivers limits the possible introduction points into the Suir system;
3. No works are required within the Lower Suir SAC boundary, the closest stream crossings are on the Owenbeg river at least 3km upstream of the SAC boundary;
4. The Conservation Objectives will not be undermined.

UWF Replacement Forestry –*Screened Out at Stage 1*

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Impact Significance: No Liklihood of Significant Effect

Upperchurch Windfarm – *Screened Out at Stage 1*

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Impact Significance: No Liklihood of Significant Effect

UWF Other Activities

Effect Magnitude:
There are no watercourse crossing works proposed in relation to the UWF Other Activities within the River Suir catchment; however, such activities are located within the upper Clodiagh (Tipperary) and upper Multeen sub-catchments.

Impact Significance: No adverse effect on Site Integrity due to:

1. The implementation of Best Practice measures which will be a contractual obligation upon any appointed contractor, which include specific biosecurity measures for the prevention of IAS introduction (including Crayfish Plague) and spread.

REFERENCE DOCUMENT

Qualifying Interest	Floating river vegetation (3260) / Alluvial forests (91E0) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*)/ Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)

2. There are no watercourse crossings required relating to the UWF Other Activities within the River Suir catchment; therefore, the potential risk of spread and the effectiveness of any surface water flowpaths to act as connecting vectors to the downstream SAC is limited;
3. Conservation Objectives will not be undermined.

Whole UWF Project

Description of the in combination effect of all five Individual Project Elements together

Effect Magnitude: Aquatic invasive species may be introduced or to unaffected catchments or spread within infected watercourses during the course of instream works or transported via excavation works by site machinery. The spatial extent of infection arises during construction but can potentially have significant downstream effects which extend throughout the catchment downstream. The incidence of a single, once-off introduction can have lasting, long-term ecosystem effects which can persist beyond any control measures for eradication. In this respect, spread of aquatic invasive species is evaluated as non-reversible. All watercourses within the works area contain highly sensitive aquatic ecology and fisheries receptors downstream. There is the potential for introduction of non-native, invasive aquatic species at stream crossing associated with the consented wind-farm works. The construction phase works requiring watercourse crossings and works in proximity to watercourses associated with the Grid Connectionthe UWF Grid Connection and UWF Related Works present the greatest risk; which has been managed as outlined below.

Whole UWF Project Impact Significance: No adverse effect on Site Integrity due to:

1. The watercourse crossing works required for the UWF Grid Connection are largely located within the River Shannon catchment while the watercourse crossings required for the Upperchurch Windfarm and UWF Related Works are largely located in the River Suir surface water catchment. **31 no.** crossings are required in the Suir catchment in total and the potential for downstream effects are identified with regard to the UWF Grid Connection, UWF Related Works and UWF Related Activities. The significance of effects is considered with regard to the size and scale of the works proposed.
2. The implementation of Best Practice measures which will be a contractual obligation upon any appointed contractor, which include specific biosecurity measures for the prevention of IAS introduction (including Crayfish Plague) and spread.
3. The majority of the watercourses intercepted by the proposed construction work are located upstream of the SAC are drains or marginal watercourses which have typically low flows, and therefore the effectiveness of them acting as surface water flowpaths to the downstream SAC is limited;
4. The watercourse crossings and instream works associated with the project elements are located approximately 12km upstream of the SAC boundary on the Clodiagh (Tipperary) sub-catchment and at least 3km upstream of the SAC boundary on the Owenbeg sub-catchment.
5. The Conservation Objectives will not be undermined.

Lower River Suir SAC (002137)

Decrease in habitat quality via: surface water runoff, sediment entrainment or release; release of fuels oils/ chemicals, surface/ ground water quality impacts

Table 5.14: Decrease in habitat quality via: surface water runoff, sediment entrainment or release, release of fuels oils/ chemicals, surface/ ground water quality impacts

Qualifying Interest	Floating river vegetation (3260) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*) Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*)/ Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)
Project Stage	Construction/Operation (Maintenance and Surface water runoff)

Potential Impact Source Identified: Movement of soils/Instream Works/Machinery Movement/Excavation Works/Forestry Felling/Hydrocarbons/Reinstatement/Overburden Storage/Sediment/Use of Cement Based Compounds/Permanent Access Roads and Hardstanding/Dewatering of excavations
Impact Pathway: Surface water and Ground Water Flowpaths/Soil

Impact Description:
Aquatic habitat relates to the instream features supporting aquatic biodiversity (bed substrate, morphology, water quality, etc.). Watercourses are highly sensitive to change, containing sensitive aquatic ecological receptors including salmonids, lamprey species, and a diverse macroinvertebrate community. Instream works at some watercourses will require direct excavation of the banks and bed of the watercourse, which can change the physical character of the watercourse and has the potential to degrade the quality of the baseline habitat which supports the structure, function and diversity of aquatic species within the affected reach. Although erosion and deposition are natural process in watercourses, varying naturally throughout the year, additional sediment contributions entering the watercourse, such as from construction works adjacent to or upstream of individual watercourses, can have negative implications for fish and invertebrates due to physical damage and reduced feeding/foraging, as well as negative impacts due to compaction of spawning gravels and mortality impacts for salmonid eggs (affecting recruitment) and invertebrate life stages within gravel substrates (interstitial spaces). These impacts may be mobilised downstream and affect river reaches at a distance from the physical works. In addition, water quality effects due to contamination by fuels, oils or cementitious material has the potential to lead to direct toxicity events, or sub-lethal degradation of aquatic habitat quality.

Individual Project Elements of the Whole UWF Project
Description of the magnitude and significance of the impact caused by each project element individually

UWF Grid Connection

Effect Magnitude:

Within the River Suir catchment, the last c.1.2km of the 110kV UGC route is located within the Clodiagh (Tipperary) River local surface water body. This will require 1 no. compound, 1 no. joint bay and mainly temporary access roads in addition to the trench; there are no proposed temporary or permanent overburden storage areas required for the UWF Grid Connection within the River Suir catchment. The UWF Grid Connection construction works are located at least 12km upstream of the River Suir SAC within the Clodiagh (Tipperary) sub-catchment. From a total of 90 No. watercourse crossings within the construction works area boundary associated with the UWF Grid Connection, riparian habitat within two crossing locations will be affected at **2 No.** watercourse crossing locations within the River Suir regional catchment (crossings W64 and W65). Both watercourses are evaluated as having no fisheries value, characterised as drainage channels.

The effect on the physical instream habitat i.e. watercourse channel morphology, substrate, and flow character due to instream works has been evaluated as potentially resulting in localised and temporary effects on the availability, diversity and quality of instream habitat supporting aquatic species; however, such effects are limited to the individual watercourses affected by the proposed works.

Qualifying Interest	Floating river vegetation (3260) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*) Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*)/ Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)

Significance: No adverse effect on Site Integrity due to:

1. Instream works and control of water quality impacts will be managed through the full implementation of Project Design measures which will be delivered as a contractual obligation for the Contractor on site;
2. Only **2 no.** watercourse crossings are required within the Suir Catchment, located within the upper reaches of the Clodiagh (Tipperary) River catchment. The watercourses affected are evaluated as having no fisheries value and are characterized as drainage channels with low flows;
3. Erosion and sediment control measures, as specified in Project Design measures will be implemented in full to avoid downstream effects on aquatic habitat quality (siltation / sedimentation) affecting aquatic Annex II species within the SAC designation;
4. Instream works and watercourse crossings are separated from the SAC boundary on the Clodiagh (Tipperary) River main channel by a distance of approximately 12km upstream;
5. It is noted that the Clodiagh (Tipperary) and the Multeen are both identified as Margaritifera Sensitive Areas, containing an extant population of Annex II listed Freshwater pearl mussel. However, both of these populations are hydrologically separated from the Freshwater pearl mussel population in the Clodiagh (Portlaw) sub-catchment in the lower Suir, where the latter population is the only one listed in the Lower River Suir SAC Conservation Objectives.
6. Conservation Objectives will not be undermined.

UWF Related Works

Effect Magnitude:
The majority of the footprint of the UWF Related Works is located within the River Suir regional catchment; mainly in the Clodiagh (Tipperary) River sub-catchment, with the remainder within the Turraheen River (Multeen East), and Owenbeg River sub-catchments. The watercourses affected are evaluated as having high fisheries value in the local context and generally support salmonid populations contiguous with the mainstem rivers downstream within the SAC.

Of the total 17.9km of internal windfarm cabling, 16.2km is located within the River Suir catchment. In terms of the watercourse crossings associated with the UWF Related Works, 31 no. of the total 32 no. are located within the River Suir catchment. Of the 31 no. watercourse crossings within the River Suir catchment, 26 no. are at least 12km upstream (Clodiagh River catchment) of the Lower River Suir SAC and the remaining 5 no. are at least 3km upstream of the SAC (Owenbeg River catchment).

Significance: No adverse effect on Site Integrity due to:

1. Instream works and control of water quality impacts will be managed through the full implementation of Project Design measures which will be delivered as a contractual obligation for the Contractor on site;
2. **31 no.** watercourse crossings are required within the Suir Catchment, located within the upper reaches of the Clodiagh, Owenbeg and Turraheen (Multeen East) river catchments.
3. Erosion and sediment control measures, as specified in Project Design measures will be implemented in full to avoid downstream effects on aquatic habitat quality (siltation / sedimentation) affecting aquatic Annex II species within the SAC designation.
4. Instream works and watercourse crossings are separated from the SAC boundary on the Clodiagh (Tipperary) River main channel by a distance of approximately 12km upstream, with works in the Owenbeg catchment at a distance of at least 3km upstream of the SAC boundary;
5. It is noted that the Clodiagh (Tipperary) and the Multeen are both identified as Margaritifera Sensitive Areas, containing an extant population of Annex II listed Freshwater pearl mussel. However,

Qualifying Interest	Floating river vegetation (3260) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*) Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*)/ Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)

both of these populations are hydrologically separated from the Freshwater pearl mussel population in the Clodiagh (Portlaw) sub-catchment in the lower Suir, where the latter population is the only one listed in the Lower River Suir SAC Conservation Objectives.

6. The Conservation Objectives will not be undermined.

UWF Replacement Forestry –*Screened Out at Stage 1*

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Impact Significance: No Likelihood of Significant Effect

Upperchurch Windfarm – *Screened Out at Stage 1*

Effect Magnitude: Potential for adverse effect excluded – Screened Out at Stage 1

Impact Significance: No Likelihood of Significant Effect

UWF Other Activities

Effect Magnitude:
There are no watercourse crossing works proposed in relation to the UWF Other Activities within the River Suir catchment; however, such activities are located within the upper Clodiagh (Tipperary) and upper Multeen sub-catchments. Indirect impacts affecting riparian habitat are limited to surface water run-off and pollution events which may occur via surface flow pathways.

Significance: No adverse effect on Site Integrity due to:

1. Control of water quality impacts will be managed through the full implementation of Project Design measures which will be delivered as a contractual obligation for the Contractor on site;
2. There are no watercourse crossings required within the Suir Catchment associated with the UWF Other Activities, pathways for surface water flows affecting instream habitat within the proximity of the works area, or at a distance downstream within the SAC are limited.
3. Erosion and sediment control measuresSurface water protection measures, and Best practice measures in respect of disturbance to lands, as specified in Project Design measuresBPM's will be implemented in full to avoid downstream effects on aquatic habitat quality (siltation / sedimentation) affecting aquatic Annex II species within the SAC designation.
4. It is noted that the Clodiagh (Tipperary) and the Multeen are both identified as Margaritifera Sensitive Areas, containing an extant population of Annex II listed Freshwater pearl mussel. However, both of these populations are hydrologically separated from the Freshwater pearl mussel population in the Clodiagh (Portlaw) sub-catchment in the lower Suir, where the latter population is the only one listed in the Lower River Suir SAC Conservation Objectives.
5. Conservation Objectives will not be undermined.

Whole UWF Project
Description of the in combination effect of all five Individual Project Elements together

Effect Magnitude:
A potential decrease in aquatic habitat quality is identified at watercourse crossings where instream works are required; such effects are limited to the local context of the required works and are temporary in nature. The watercourses affected are evaluated generally as having high fisheries value in the local context and generally support salmonid populations contiguous with the mainstem rivers downstream within the SAC.

REFERENCE DOCUMENT

Qualifying Interest	Floating river vegetation (3260) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*) Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*)/ Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)

Instream habitats will be directly affected at a total of **31 No**. watercourse crossings within the Suir catchment, including the upper Clodiagh (Tipperary), Turraheen (Multeen East) and Owenbeg rivers. There are no instream works or works within the riparian zone required within or directly adjacent to the Lower Suir SAC. Therefore, pathways for effects on aquatic habitats within the SAC are limited to downstream effects arising via transportation of silt or water quality impacts via surface water pathways.

Whole UWF Project Impact Significance: No adverse effect on Site Integrity due to:

1. Control of water quality impacts will be managed through the full implementation of Project Design measures which will be delivered as a contractual obligation for the Contractor on site;
2. There are no watercourse crossings required within the Suir Catchment associated with the UWF Other Activities, pathways for surface water flows affecting instream habitat within the proximity of the works area, or at a distance downstream within the SAC are limited.
3. Erosion and sediment control measures, as specified in Project Design measures will be implemented in full to avoid downstream effects on aquatic habitat quality (siltation / sedimentation) affecting aquatic Annex II species within the SAC designation.
4. Instream works and watercourse crossings are separated from the SAC boundary on the Clodiagh (Tipperary) River main channel by a distance of approximately 12km upstream, with works in the Owenbeg catchment at a distance of at least 3km upstream of the SAC boundary;
5. It is noted that the Clodiagh (Tipperary) and the Multeen are both identified as Margaritifera Sensitive Areas, containing an extant population of Annex II listed Freshwater pearl mussel. However, both of these populations are hydrologically separated from the Freshwater pearl mussel population in the Clodiagh (Portlaw) sub-catchment in the lower Suir, where the latter population is the only one listed in the Lower River Suir SAC Conservation Objectives.
6. Conservation Objectives will not be undermined.

REFERENCE DOCUMENT

Slievefelim to Silvermines SPA (004077)

Reduction in or Loss of suitable or potentially suitable Hen Harrier Foraging Habitat (alone)

Table 5-10: Reduction in or Loss of suitable or potentially suitable Hen Harrier Foraging Habitat (alone)

Special Conservation Interest	**Hen Harrier**
Project Stage	Construction Stage

Potential Impact Source Identified: Land Use Change provision of new permanent access roads, permanent berms and harvestor crossing locations
Impact Pathway: Land cover

Impact Description:
Hen Harrier is a very high sensitivity receptor of International Importance. Land take or land use/cover change of foraging habitats such as grassland, scrub, bog and forestry during the construction stage may cause secondary effects for this Annex I species and SPA qualifying interest. Permanent loss of foraging habitat through land take or land use change may result in the permanent exclusion of birds from potentially viable habitat which forms the constitutive characteristic of the SPA. This may result in long term knock on effects on breeding success of birds within the SPA, through the reduced availability of foraging resources.

The spatial extent of land use change will be limited to the construction of new permanent roads, berms, clearfelling, and change in use of lands adjacent to roads or at harvestor crossings in (currently) mature coniferous forestry and in grassland fields.

Any impact is negated by the provision of concealed geogrid roadwaysthe use of Concealed Access Road instead of standard stone roads for all new permanent roads within the SPA. These Concealed Access Roads, will be planted with heathers and/or grasses or a combination of both, for all new permanent roads within the SPA. The clearfelled corridor at Castlewaller/Killeen will contain a Concealed Access Road, which, along with the remainder of the corridor at that location, will be planted with mature native heather and grasses (Irish or Scottish) to provide foraging habitat for harriers. Planting of the geocell with mature plantlets along with a suitable grass nurse will take place prior to construction at a preparation nursery site to avoid any time delay in the provision of habitat at source.

Permanent berms will be immediately planted with heather and grass nurses. Reinstatement will be overseen by the project Ecologist. Temporary storage berms, (n=22) are proposed along the UGC route; a project design measure is in place to ensure these are immediately re-instated to their previous ground condition at that location.

Temporary land use change will occur for works such as cable trenching/laying, and temporary access roads, temporary hedgerow removal and temporary storage berms, (n=22) are proposed along the route of the 110kV UGC; a project design measure is in place to ensure that these areas will be reinstated immediately following construction to their previous ground condition at that location, thus avoiding significant effects. The extent of any hedgerow removal (temporary or permanent) will result in no likelihood of significant effects. Activities such as the strimming of small areas of Devils Bit Scabious to avoid effects on Marsh Fritillary are not likley to result in significant effects in respect of Hen Harrier.

All re-instatement works will be overseen by a suitably qualified Project Ecologist.

REFERENCE DOCUMENT

Special Conservation Interest	**Hen Harrier**

Individual Project Elements of the Whole UWF Project

Description of the magnitude and significance of the impact caused by each project element individually

UWF Grid Connection

Effect Magnitude:
Total, permanent land use change, within the SPA is in the order of 1.988Ha from 9 no. habitat types which include:
Improved Agricultural Grassland (GA1) – 0.084Ha
Spoil and Bare Ground (ED2) – 0.013Ha
Recolonising Bare Ground (ED3) – 0.008Ha
Buildings and Artifical Surfaces (BL3) – 0.004Ha
Wet Grassland (GS4) - 0.106Ha
(Mixed) Broadleaf Woodland (WD1) – 0.009Ha
Conifer Plantation (WD4) – 1.610Ha
Wet Grassland/Scrub mosaic (GS4/WS1) – 0.045Ha
Scrub (WS1) – 0.109Ha

For the avoidance of doubt the calculation of permanent land take is based on all new permanent access roads (notwithstanding the use of Concealed Access Roads at these locations), permanent berms (including overburden storage berms and notwithstanding seeding will take place immediately) and forestry felling (notwithstanding that not all this habitat is currently suitable).

From these, the habitat classification 'Buildings and Artifical Surfaces' is excluded from further consideration as suitable foraging habitat.

The remaining habitats (1.984Ha in total) are all assumed to be suitable foraging habitat for Hen Harrier in line with the precautionary principle.

Of this, 0.696Ha will be Concealed Access Roads planted with native grasses or heather as already described. Concealed Access Roads will occur in improved agricultural grassland (0.081Ha), Spoil and bare Ground (0.009Ha), Wet Grassland (0.106Ha), (Mixed) Broadleaf woodland (0.009Ha), Conifer Plantation (0.433Ha), Wet Grassland/Scrub Mosaic (0.042Ha) and Scrub (0.015Ha).

0.434Ha will be permanent berms which will be immediately reinstated with heathers and grasses; these will include Spoil and Bare Ground (0.005Ha), Conifer Plantation (0.377Ha), Scrub (0.044Ha), and Recolonising Bare Ground (0.008Ha).

0.030Ha will be harvestor crossings on the Concealed Access Roads, exclusively in Conifer Plantation which will be immediately reinstated with heathers and grasses.

0.825Ha of felling/land use change will include Conifer Plantation (0.770Ha), Wet Grassland/Scrub Mosaic (0.003Ha), Scrub (0.049Ha) and Improved Agricultural Grassland (0.003Ha). This land use change corresponds to forestry felling at Castlewaller (0.699Ha) but also smaller amounts at varying locations along the grid route such as the margins of forestry roads, where the grid route enters forestry compartments or at points of curvature in the grid cable route. All will be immediately reinstated.

Significance: No adverse effect on Site Integrity due to:

1. The mitigation to be applied at source (use of Concealed Access Roads, immediate reinstatement of berms, harvestor crossing points and other permanent land use change locations with heather and

REFERENCE DOCUMENT

Special Conservation Interest	Hen Harrier

grasses), ensures there will be no permanent exclusion of Hen Harrier from currently suitable or potentially suitable foraging lands, thus ensuring;

2. The constitutive characteristics of the European Site will remain viable, as a result of;
3. Preventative measures based on tried and tested methods/ Best Practice, and;
4. Conservation Objectives will not be undermined.

UWF Related Works

Effect Magnitude:
HW7 is the only location where the construction works boundary overlaps the SPA. There will be no land use change at this location and no currently suitable or potentially suitable lands will be excluded from availability to Hen Harrier.

Significance: No adverse effect on Site Integrity due to:

1. There will be no permanent exclusion of Hen Harrier from currently suitable or potentially suitable foraging lands, thus ensuring;
2. The constitutive characteristics of the European Site will remain viable, as a result of;
3. Avoidance of effects at source, and;
4. Conservation Objectives will not be undermined.

UWF Replacement Forestry- *Screened Out at Stage 1*

Effect Magnitude:
Available foraging habitat for Hen Harrier currently within the land folio boundary comprises improved agricultural grassland (3.54Ha); Wet Grassland (0.44Ha) and Scrub (0.01Ha); in total 3.99Ha. This entire area will undergo landuse change to UWF Replacement Forestry (deciduous forestry) to be managed specifically for the use of Hen Harrier, including the incorporation of 'tried and tested' management measures which facilitate Hen Harrier foraging and usage. All of the lands are currently outside the SPA.

Significance: No likelihood of Significant Effect due to:

1. There will be no permanent exclusion of Hen Harrier from currently suitable or potentially suitable foraging lands within the SPA, thus ensuring;
2. The constitutive characteristics of the European Site will remain viable, as a result of;
3. Avoidance of effects by virtue of separation distance, and;
4. Significant effects on the Integrity of the SPA are unlikely.

Upperchurch Windfarm – *Screened Out at Stage 1*

Effect Magnitude:
As per the 2013 RFI the magnitude of foraging habitat loss was calculated as 95Ha (actual loss plus effective loss through displacement effects). For completeness, given that the estimate of total displacement was based on 2017 as the construction year, an upwardly revised total estimate of 98.11Ha has been extrapolated from data provided in the RFI (Table 7 of the UWF Ecological Management Plan) corresponding with a predicted construction year of 2019.

All habitat loss (both direct and secondary effective loss through displacement) occurs outside the SPA.

Special Conservation Interest	**Hen Harrier**

Significance: No likelihood of significant effects due to:The effect on European Sites under consideration will **not be significant** as:

1. There will be no permanent exclusion of Hen Harrier from currently suitable or potentially suitable foraging lands within the SPA, thus ensuring;
2. The constitutive characteristics of the European Site will remain viable, as a result of;
3. Avoidance of effects by virtue of separation distance.

UWF Other Activities – *Screened Out at Stage 1*

Effect Magnitude:
Haul Route Activities will not result in loss of foraging habitat. Overhead Line Activities will not result in loss of foraging habitat.

The Upperchurch Hen Harrier Scheme will result in 2.2Ha of trees, 1.4km of riparian habitat and 2.8km of new hedgerow being enhanced or created during initial activities. In total 128Ha of agricultural lands will be managed for the benefit of Hen Harrier, outside the turbine 250m buffer and the footprint of the development; as per the EMP.

All of the above will occur outside the SPA.

Monitoring Activities will not result in a loss of Hen Harrier foraging habitat.

Significance: No likelihood of significant effects due to:

1. There will be no permanent exclusion of Hen Harrier from currently suitable or potentially suitable foraging lands within the SPA, thus ensuring;
2. The constitutive characteristics of the European Site will remain viable, as a result of;
3. Avoidance of effects by virtue of separation distance, and;
4. The absence of negative quality effects from activities such as the Upperchurch Hen Harrier Scheme.

Whole UWF Project
Description of the in combination effect of all five Individual Project Elements together

Effect Magnitude:
Both positive and negative quality effects occur with regard to Hen Harrier foraging Habitat loss across the Whole UWF Project.

The possibility of significant effects via permanent exclusion of Hen Harrier from suitable or potentially suitable foraging habitats within the SPA is only in the order of the grid connection project element. Remaining project elements will not contribute to the exclusion of lands from foraging by Hen Harrier, and certain activities such as the Upperchurch Hen Harrier Scheme are anticipated to have a positive effect on Hen Harrier, however this is not relied on herein as a determinant of significance in terms of effects on European Sites.

In respect of the UWF Grid Connection project element, project design measures implemented at source will ensure that no Hen Harrier are permanently excluded from currently suitable or potentially suitable lands.

All re-instatement will be immediate and thus avoid the potential for cumulative sequential effects during the construction period.

REFERENCE DOCUMENT

Special Conservation Interest	**Hen Harrier**

Significance: No adverse effect on Site Integrity due to:

1. There will be no permanent exclusion of Hen Harrier from currently suitable or potentially suitable foraging lands within the SPA, thus ensuring;
2. The constitutive characteristics of the European Site will remain viable, as a result of;
3. Avoidance of effects by virtue of separation distance (Project elements 3,4 and 5), and;
4. Avoidance of effects at source in respect of Project Element 1 through Project Design preventative measures, and;
5. Avoidance of effects at source, through avoidance in respect of Project Element 2;
6. Conservation Objectives will not be undermined.

Slievefelim to Silvermines SPA (004077)

Hen Harrier: Inadvertant Mortality of Hen Harrier in or at Nest or Roost Sites

Table 5-22: Inadvertent mortality of Hen Harrier in or at Nest or Roost Sites.

Special Conservation Interest:	**Hen Harrier**
Impact:	**Inadvertant Mortality of Hen Harrier in or at Nest or Roost Sites**
Project Stage	Construction /Operational Maintenance

Potential Impact Source Identified: Forestry Felling/ Operating Machinery
Impact Pathway: Contact

Impact Description:
Inadvertant mortality may occur during the construction stage should land use change overlap nesting or roosting locations. Whilst no suitable breeding habitat is currently present within the construction works boundary, the likelihood that habitats may be suitable at the point of construction, as a result of clearfelling, the availability of forest rides , wind blown areas or choice of nesting location outside the normal paradigm (for instance nesting in trees has been documented in the Irish context see Scott&Hipkiss, 2006) is not precluded nor is the future potential for available habitat during operational maintenance as a result of the natural rotation of the forest estate.

Whilst winter roosting birds are unlikely to remain in situ to the point of physical contact with operating machinery (thus avoiding mortality), this is dependant on variables such as weather, visibility and the propensity of the birds to flush versus remain under cover. During the breeding season incubating female Hen Harriers will 'sit tight' on a clutch until proximity is immediate (usually <5m – Watson,1977); which may be too late to avoid mortality of young in the event of machinery usage in close quarters.

Mortality of adults or young, at the egg or hatchling stage, is considered as possibly likley to have significant effects on reproductive output. Adult birds may not attempt to nest until the next calendar year and thus annual recruitment into the SPA population is reduced.

Project Design Measures:

1. If UWF Grid Connection works are programmed to begin in the Hen Harrier breeding season (March to August) confirmatory hen harrier breeding surveys will be completed, before such works initiate, such that all pre breeding nuptial activity, nesting activity and active nests are recorded within 2km of the construction works area boundary. These surveys will be completed prior to the start-up of all construction activities, until construction is complete. No construction works will take place within 500m of an active hen harrier breeding attempt or active nesting activity, during the breeding season (March to August).
2. During the hen harrier roosting season (October to February inclusive), construction works associated with the UWF Grid Connection within 1000m of a roost will be limited to the period between one hour after sunrise to one hour before sunset.
3. Annual visual inspections of the lands over the 110kV UGC and the testing/inspection/planned maintenance at Joint Bays, will be scheduled outside of the hen harrier breeding season, on those parts of the 110kV UGC which occurs within the boundary of the Slievefelim to Silvermines SPA.
4. No UWF Replacement Forestry planting works will take place within 500m of an active hen harrier nest, or active nesting activity, during the months of March to August. Additionally, during the winter season, October to February, planting works will only be carried out during the period between one hour after sunrise and one hour before sunset in areas within 1000m of an active winter roost.
5. Prior to the carrying out of any construction works at Upperchurch Windfarm between mid-March and mid-August, a survey for breeding Hen Harriers shal be carried out by a competent, experienced ornithologist. The survey will cover the area within 500m of the works to be carried out during the above period. It will be the responsibility of the ornithologist to ensure that a hen harrier breeding site

Special Conservation Interest:	**Hen Harrier**
Impact:	**Inadvertant Mortality of Hen Harrier in or at Nest or Roost Sites**

is not overlooked. Taking into account the results of this survey no construction works shall be carried out within the above period within 500m of a pre nesting breeding site and/or nest, except with the written approvalof the National Parks and Wildlife Service.

6. Except with the approval of the National Parks and Wildlife Service: no UWF Other Activities will be carried out within 500 metres of an active hen harrier nest or nesting attempt.
7. The identification of all breeding attempts and communal winter roosts through confirmatory surveys, and the resultant exclusion zones, will ensure that inadvertent mortality is avoided.

Individual Project Elements of the Whole Windfarm Project

Description of the magnitude and significance of the impact caused by each project element individually

UWF Grid Connection

Effect Magnitude

1. 3-4 Hen Harrier nests occur within a 2km buffer of proposed UWF Grid Connection construction works area boundaries and thus may be affected..
2. 3 winter roosts occur within a 2km buffer of the proposed UGC route, one of which is situated within 500m of the 110kV UGC.

Significance: No adverse effect on Site Integrity due to:

1. Project Design measures Measures will identify the potential for and avoid inadvertent mortality;
2. Conservation Objectives will not be undermined.

UWF Related Works

Effect Magnitude:

1. No Hen Harrier nests occur within a 2km buffer of proposed worksUWF Related Works construction works areas and thus may be affected by mortality related pathways.
2. No winter roosts occur within a 2km buffer of the UWF Related Works.
3. All UWF Related Works locations, with the exception of HW7, occur outside the SPA.

Significance: No adverse effect on Site Integrity due to:

1. Project Design measures will identify the potential for and avoid inadvertent mortality;
2. Conservation Objectives will not be undermined

UWF Replacement Forestry –*Screened Out at Stage 1*

Effect Magnitude:

Potential for adverse effect excluded – Screened Out at Stage 1.

The location is currently unsuitable for breeding or winter roosting. It is also located in its entirety outside the SPA. All works will be done by hand and/or are equivalent to typical farming activities. There will be no increase in availability of access to lands.

Significance: No likelihood of Significant Effect due to:

1. The location of Replacement Forestry is outside the SPA, and;
2. All works will be done by hand and/or are equivalent to typical farming activities, and;
3. Notwithstanding this the implementation of Project Design mitigation measures as described, which ensures;
4. Conservation Objectives will not be undermined.

Special Conservation Interest:	**Hen Harrier**
Impact:	**Inadvertant Mortality of Hen Harrier in or at Nest or Roost Sites**

Upperchurch Windfarm –*Screened Out at Stage 1*

Effect Magnitude:
Potential for adverse effect excluded – Screened Out at Stage 1.
No Hen Harrier breeding or roosting habitat occurs within the Upperchurch Windfarm construction works wind farm works area boundary, nor have birds been recorded utilising the project element locationthe windfarm site for activities other than foraging. The consented Upperchurch Wwindfarm is located in its entirety outside the SPA.

Significance: No likelihood of Significant Effect due to:

1. No nesting of the species occurs within the windfarm, which;
2. Is located outside the SPA, and;
3. The protection measures described herein and stipulated as Condition 17 in the 2014 Grant of Permission & Conditions for Upperchurch Windfarmgrant of planning.
4. The absence of winter roosting as described in the previous studies for the wind farmUpperchurch Windfarm.

UWF Other Activities

Effect Magnitude:
With the exception of Monitoring Activities, all locations of UWF Other Activities occur outside the SPA. Grid Connection Monitoring activities will take place within the SPA, where;

1. 3-4 Hen Harrier nests occur within a 2km buffer of proposed UWF Grid Connection construction works area boundaries and thus may be affected..

2. winter roosts occur within a 2km buffer of the proposed UGC route, one of which is situated within 500m of the 110kV UGC.

Significance: No adverse effect on Site Integrity due to

1. The location of UWF Other Activities is primarily outside the SPA, and
2. Those monitoring activities that do occur within the SPA will be minimal and in many instances conducted at Distance (such as the identification of nest locations);
3. Notwithstanding this the implementation of Project Design mitigation measures as described, will ensure;
4. Conservation Objectives will not be undermined.

Whole Windfarm Project
Description of the in combination effect of all five Individual Project Elements together

Effect Magnitude: The order of effect is essentially the UWF Grid Connection which is the Project Eelement where works will primarily occur within the zone of effect for inadvertent mortality. Both nesting and winter roost Hen Harrier occur along this route of the 110kV UGC. Project design Measures will avoid mortality effects at source, including cumulative effects from multiple sources being present at any given time, as the measures to be employed will prevent multiple work locations being operational at any instance within the specified distance of a nest or winter roost.

Significance: No adverse effect on Site Integrity due to;

1. Project Design Measures being implemented to protect nesting and winter roosting Hen Harrier ensures;
2. Conservation Objectives will not be undermined.

REFERENCE DOCUMENT

Slievefelim to Silvermines SPA (004077)

Disturbance / Displacement of Nesting / Roosting Hen Harrier

Table 5-23: Disturbance / Displacement of Nesting / Roosting Hen Harrier

Special Conservation Interest:	**Hen Harrier**
Impact:	**Disturbance / Displacement of Nesting / Roosting Hen Harrier**

Potential Impact Source Identified Noise and Human Activity
Impact Pathway: Visibility

Impact Description:
Typical sources of construction related disturbance effects on Hen Harrier, (Ruddock and Whitfield 2007), include noise and visual intrusion. Harriers may also be affected from disturbance during preliminary survey and construction works (Madders and Whitfield 2006, cited in Wilson *et al.,* 2016) or displacement due to habitat modification during construction activities (Masden 2010, Pearce-Higgins *et al*., 2012). Similar pathways exist in terms of operational maintainance works.

The effects of disturbance in respect to Hen Harrier which may be present during the breeding season (March –August) may be nest desertion, reduced incubation periods (resulting in embryo mortality), or additional stress on adult birds due to their propensity to alarm at intruders. Some or all of these effects may result in longer term abandonment of nesting areas, with resultant local and/or population level effects within the SPA. Whilst raptors in general may accept short infrequent disturbance events proximal to nests, sudden changes such as at the start of the breeding season, may provoke a higher level of response (Petty, 1998).

Effects which are likley in the event of disturbance to communally roosting Hen Harrier during the winter months include increased stress to roosting birds , which may have knock on effects on survival rates in particular during periods of poor weather or where foraging resources are low, and in a worst case scenario, roost desertion. Loss of secure winter roost sites may therefore increase adult mortality during winter months and notwithstanding recruitment, potentially affect subsequent breeding numbers, breeding output and hence the structure and function of the SPA. Although not all wintering birds may be breeding in the SPA, overlap is assumed in line with the precautionary principle.

Project Design Measures:

1. If UGC works are programmed to begin in the Hen Harrier breeding season (March to August) confirmatory hen harrier breeding surveys will be completed, before such works initiate, such that all pre breeding nuptial activity, nesting activity and active nests are recorded within 2km of the construction works area boundary. These surveys will be completed prior to the start-up of all construction activities, until construction is complete. No construction works will take place within 500m of an active hen harrier breeding attempt or active nesting activity, during the breeding season (March to August).
2. During the hen harrier roosting season (October to February inclusive), construction works (UGC) within 1000m of a roost will be limited to the period between one hour after sunrise to one hour before sunset.
3. Annual visual inspections of the lands over the 110kV UGC and the testing/inspection/planned maintenance at Joint Bays, will be scheduled outside of the hen harrier breeding season, on those parts of the 110kV UGC which occurs within the boundary of the Slievefelim to Silvermines SPA.
4. No UWF Replacement Forestry planting works will take place within 500m of an active hen harrier nest, or active nesting activity, during the months of March to August. Additionally, during the winter season, October to February, planting works will only be carried out during the period between one hour after sunrise and one hour before sunset in areas within 1000m of an active winter roost.
5. Prior to the carrying out of any construction works at Upperchurch Windfarm between mid-March and mid-August, a survey for breeding Hen Harriers shal be carried out by a competent, experienced

Special Conservation Interest:	**Hen Harrier**
Impact:	**Disturbance / Displacement of Nesting / Roosting Hen Harrier**

ornithologist. The survey will cover the area within 500m of the works to be carried out during the above period. It will be the responsibility of the ornithologist to ensure that a hen harrier breeding site is not overlooked. Taking into account the results of this survey no construction works shall be carried out within the above period within 500m of a pre nesting breeding site and/or nest, except with the written approvalof the National Parks and Wildlife Service.

6. Except with the approval of the National Parks and Wildlife Service: no Other Activities will be carried out within 500 metres of an active hen harrier nest or nesting attempt.

Ruddock and Whitfield, 2007, provides background citations from the grey literature on disturbance to Hen Harriers from construction and human activities (e.g. Brown and Amadon 1968, Newton 1979). In addition, the paper cites further references to buffer zone recommendations within the literature, such as Romin and Muck (1999), who recommended a 500m buffer for Northern Harrier, a species very similar to Hen Harrier, and formerly considered conspecific (i.e. the same species). The expert review of disturbance presented by Ruddock and Whitfield (2007) suggests active disturbance events during the incubation period for Hen Harrier are, in the view of the majority of experts, likely to occur at <10-500m from a nest.

In addition, Arroyo *et al*. (2009) investigated Hen Harrier foraging and found that the duration and spatial extent of male hunting intensity varied between sites and breeding periods, being lower during the nestling (i.e. when young are in the nest) than the incubation period. The effect of distance to the nest was large for females but minimal for males, with females restricting most of their hunting to within 300–500m of the nest. Thus, construction related activities outside a 500m zone around a nest are considered unlikely to significantly affect incubating/foraging females. The selection of a 500m exclusion buffer around nests and an avoidance of annual visual inspections within the period of March to August is therefore in line with established expert opinion.

With regard to the protection of roosts a minimum distance of 1000m i.e. twice that within which breeding season disturbance may have effect is considered a cautionary approach, again in line with tried and tested techniques. In published studies on winter roosts most birds arrive within the hour preceeding sunset and depart the roost within one hour of sunrise (Watson, 1977); therefore the temporal exclusion will allow birds to arrive and depart without experience of significant disturbance, thus maintaining the integrity of the roost site.

Individual Project Elements of the Whole Windfarm Project

Description of the magnitude and significance of the impact caused by each project element individually

UWF Grid Connection

Effect Magnitude

1. 3-4 Hen Harrier nests occur within a 2km buffer of proposed works and thus may be affected by during construction, and subsequent operational noise and visual intrusion.
2. 3 winter roosts occur within a 2km buffer of the proposed UGC route of the 110kV UGC, one of which is situated within 500m of the 110kV UGC.

Significance: No adverse effect on Site Integrity due to:

1. The implementation of Project Design mitigation Measures as described, which ensures;
2. Conservation Objectives will not be undermined.

Special Conservation Interest:	**Hen Harrier**
Impact:	**Disturbance / Displacement of Nesting / Roosting Hen Harrier**

UWF Related Works

Effect Magnitude:

1. No Hen Harrier nests occur within a 2km buffer of proposed works and thus may be affected by noise or visual intrusion during construction works or , and subsequent operational noise and visual operational activitiesintrusion.
2. No winter roosts occur within a 2km buffer of the UWF Related Works.
3. All UWF Related Works locations, with the exception of HW7, occur outside the SPA.

Significance: No adverse effect on Site Integrity due to:

1. The location of Related Works largely outside the SPA,and;
2. Notwithstanding this the implementation of Project Design mitigation measures as described, which ensures;
3. Conservation Objectives will not be undermined.

UWF Replacement Forestry-*Screened Out at Stage 1*

Effect Magnitude:

Potential for adverse effect excluded – Screened Out at Stage 1.

The location is currently unsuitable for breeding or winter roosting. It is also located in its entirety outside the SPA. All works will be done by hand and/or are equivalent to typical farming activities. There will be no increase in availability of access to lands.

Significance: No likelihood of Significant Effects, due to:

1. The location of Replacement Forestry is outside the SPA, and;
2. All works will be done by hand and/or are equivalent to typical farming activities, and;
3. Notwithstanding this the implementation of Project Design mitigation Measures as described, which ensures;
4. Conservation Objectives will not be undermined.

Upperchurch Windfarm-*Screened Out at Stage 1*

Effect Magnitude:

Potential for adverse effect excluded – Screened Out at Stage 1.

No Hen Harrier breeding or roosting habitat occurs within the wind farm works area boundary, nor have birds been recorded utilising the project element location for activities other than foraging. The consented windfarm is located in its entirety outside the SPA.

Significance: No likelihood of Significant Effects, due to:

1. No nesting of the species occurs within the windfarm, which;
2. Is located outside the SPA, and;
3. The protection measures described herein and stipulated as Condition 17 in the grant of planning.
4. The absence of winter roosting as described in the previous studies for the wind farm.

REFERENCE DOCUMENT

Special Conservation Interest:	**Hen Harrier**
Impact:	**Disturbance / Displacement of Nesting / Roosting Hen Harrier**

UWF Other Activities

Effect Magnitude:
With the exception of Monitoring Activities, all locations of UWF Other Activities occur outside the SPA. Grid Connection Monitoring activities will take place within the SPA, where;

1. 3-4 Hen Harrier nests occur within a 2km buffer of proposed UWF Grid Connection construction works area boundaries and thus may be affected.
2. 2. winter roosts occur within a 2km buffer of the proposed UGC route, one of which is situated within 500m of the 110kV UGC.

Significance: No adverse effect on Site Integrity due to

1. The location of UWF Other Activities is primarily outside the SPA, and
2. Those monitoring activities that do occur within the SPA will be minimal and in many instances conducted at Distance (such as the identification of nest locations);
3. Notwithstanding this the implementation of Project Design mitigation measures as described, will ensure;
4. Conservation Objectives will not be undermined.

Whole Windfarm Project
Description of the in combination effect of all five Individual Project Elements together

Effect Magnitude: The UWF Grid Connection is the primary sources of effects as construction works areas and Joint Bay locations will be located within the zone of effect for disturbance. Both nesting and winter roost Hen Harrier occur along the route of the 110kV UGC. Project design measures will avoid disturbance effects at source, including cumulative effects, as the measures to be employed will automatically prevent multiple work locations being operational at any given time within the specified distance of a nest or winter roost.These will also apply to any monitoring activities within the SPA.

Significance: No adverse effect on Site Integrity due to:

1. Project Design measures being implemented to protect nesting and winter roosting Hen Harrier ensures;
2. Conservation Objectives will not be undermined.

REFERENCE DOCUMENT

5.3.6 Evaluation of Effects on Key Habitats or Species (In Combination)

Effects on European Sites by virtue of cumulative and in-combination pathways to the identified Qualifying Interests of the Lower River Shannon SAC, the Lower River Suir SAC and the Special Conservation Interests of the Slievefelim to Silvermines Mountains SPA, identified in Table 5.1 are herein considered in this section. The evaluation is presented per Qualifying Interest or Special Conservation Interest (with reference to the EU Sites for which linkage exists as defined in Table 5.1) and under each Qualifying Interest or Special Conservation Interest listing, the effects are described.

Details of other plans and projects, including web links to their planning documents or other environmental information can be found in the Appendix of the EIAR Main Report Biodiversity chapter (included as Appendix A14 to this document).

5.3.6.1 Receiving Environment for Cumulative Evaluation

Both geographical and time-frame study areas were set for the cumulative evaluation, these boundaries relate to the spatial extent of in combination effects to European Sites (and their Qualifying Interests / Species of Conservation Interest) and to the life-cycle stage during which cumulative effects are expected to occur as a result of the Whole UWF Project, or its respective Project Elements. The conceptual approach to determine the geographical and time frame boundaries to the study area, and by which the selection and review of other plans and projects was considered for in combination effects on European Sites and their Qualifying Interests / Species of Conservation Interest has been defined as follows:

1. The geographical or 'spatial' boundary was identified relevant to the European Sites (and their Qualifying Interests / Species of Conservation Interest) which are in turn considered likely to be affected by at least one of the Elements of the Whole UWF Project.
2. The plans and projects which are located within these boundaries were then identified.
3. The temporal or 'time frame' boundary was defined, to indicate during which life cycle stage the effects of the Elements of the Whole UWF Project to the European Sites will occur.
4. A list of all projects built, consented or expired within a preliminary buffer zone of 15km of the Whole UWF Project Elements was collated from planning searches and independent research,
5. The potential for the other plans or projects which are located within the geographical boundaries were examined for their potential for cause effects to European Sites (and their Qualifying Interests / Species of Conservation Interest) during the temporal boundary – i.e. during the same period as the Whole UWF Project Elements).
6. Each of the plans or projects which are located within both geographical and temporary boundaries were examined for potential to cause cumulative or incombination effects to European Sites with the Whole UWF Project Elements

REFERENCE DOCUMENT

Table 5.11 Geographical boundary of the Cumulative Evaluation Geographical Study Area Extent

European Site (Qualifying Interest/Special Conservation Interest)	Geographical Boundary of the Study Area	Justification for Study Area Extent
Lower River Shannon SAC (002165) Floating river vegetation (3260)/ Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)/ Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	The regional Mulkear River catchment, including its major tributaries (Bilboa, Clare and Newport Rivers).	The Mulkear River is one of the regional catchment in which the Whole UWF Project is located. The Mulkear River catchment is partially designated within the Lower River Shannon SAC and drains to the Lower Shannon main channel. Extending the scoping area for cumulative effects beyond the Mulkear River catchment would incorporate the whole of the River Shannon SAC catchment; which at this vast scale, the Whole UWF Project would be unlikely to have a significant effect in relation to cumulative impacts. Therefore, the geographic extent is defined relative to the scale and extent of potential interactions arising from the proposed development.
Lower River Suir SAC (002137) Floating river vegetation (3260) Alluvial Forests* (91E0) Freshwater Pearl Mussel White-Clawed Crayfish Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyz-on marinus*) Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	The River Clodiagh (including Owenbeg River) and Multeen East catchments.	The River Clodiagh catchment drains the eastern portion of the Whole UWF Project, particularly in the area of the UWF Related Works and Upperchurch Windfarm. The Clodiagh main channel and the main channel of its tributary the Owenbeg River are partially partially designated within the Lower River Suir SAC. The Clodiagh drains to the River Suir main channel at Derrymore townland between Thurles town and Clonouty village. The Multeen East is a tributary within the Multeen River catchment; the Multeen is a tributary of the River Suir, the confluence is located directly north of Golden, Co. Tipperary. The main channel of the Multeen East is designated within the Lower River Suir SAC. Extending the scoping area for cumulative effects beyond the Clodiagh and Multeen catchments would incorporate the whole of the River Suir SAC catchment; at this vast scale, the Whole UWF Project would be unlikely to have a significant effect in relation to cumulative impacts. Therefore, the geographic extent is defined relative to the scale and extent of potential interactions arising from the proposed development.

REFERENCE DOCUMENT

European Site (Qualifying Interest/Special Conservation Interest)	Geographical Boundary of the Study Area	Justification for Study Area Extent
Otter - Lower River Shannon SAC (002165) and Lower River Suir SAC (002137)	7km	Territory size of Otter averages at most 13.6km equivalent to a 7km buffer and is associated with a 10m wide corridor along all SAC watercourses (as per NPWS Conservation Objectives in respect of both the Lower River Shannon and Lower River Suir).
Hen Harrier- Slievefelim to Silvermines SPA (004077)	SPA plus 5km /Project Element plus 2km	Research on the spatial ecology of Hen Harriers has shown that foraging females spend most of their time within 1km of the nest, while males hunt mostly within 2km of the nest (Arroyo *et al.,* 2009, Irwin *et al.,* 2012, Arroyo *et al.,* 2014). Therefore landscape and habitat changes within 1km of the nest may impact on both male and female foraging, while changes up to 2km from the nest are more likely to affect males only (Arroyo *et al.,* 2014). SNH (2014) also recommend a 2km buffer out from a proposal site within which data should be collected. A 5km buffer of the SPA in conjunction with a 2km buffer of the Development will ensure all likely effects are evaluated in the context of the Special Conservation Interest, the Hen Harrier bird and the SPA.

5.3.6.2 Other Projects/Activities located within the Cumulative Evaluation Geographical Study Area

Research of other projects or relevant activities in the area identified the projects/activities within the Cumulative Evaluation Geographical Study Area. These Projects/Activities are described in Table 5-12.

Table 5.12 Other Projects/Activities identified within the Cumulative Evaluation Geographical Boundary

Qualifying Interest/Special Conservation Interest	Other Project/Activity	Location of Other Project/Activity within the Cumulative Evaluation Geographical Boundary
Lower River Shannon SAC (002165)		
Floating river vegetation (3260)/Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)/Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Castlewaller Windfarm	Consented windfarm development, where all 16 no. turbines are located within the Small River catchment. The windfarm is also located upstream of the Lower River Shannon SAC

REFERENCE DOCUMENT

Qualifying Interest/Special Conservation Interest	**Other Project/Activity**	**Location of Other Project/Activity within the Cumulative Evaluation Geographical Boundary**
Floating river vegetation (3260)/Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)/Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Newport Distributor Road	Consented public road development at Newport, Co. Tipperary within the Newport River catchment. The road development is also located upstream of the Lower River Shannon SAC.
Floating river vegetation (3260)/Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)/Atlantic Salmon (***Salmo salar***)/ Sea Lamprey (***Petromyzon marinus***)/ Brook Lamprey (***Lampetra planeri***)/ River Lamprey (***Lampetra fluviatilis***)	Bunkimalta Windfarm	Consented windfarm development, where 5 no. turbines are located within the Clare River catchment and 11 no. turbines are located within the Newport River (Mulkear) catchment. The windfarm is also located upstream of the Lower River Shannon SAC
Floating river vegetation (3260)/Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)/Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Agriculture - Milking Parlour, Bunkey, Lisnagry, Co. Limerick	Consented milking parlour development within the Newport River catchment. The agricultural development is also located upstream of the Lower River Shannon SAC
Floating river vegetation (3260)/Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)/Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Housing Development Doon, Doon, Co. Tipperary	Consented development upstream of the River Shannon SAC within the Mulkear River catchment
Floating river vegetation (3260)/Alluvial forests	Agricultural sheds and stores, Killuragh,	Consented development upstream of the River Shannon SAC within the Mulkear River catchment

REFERENCE DOCUMENT

Qualifying Interest/Special Conservation Interest	Other Project/Activity	Location of Other Project/Activity within the Cumulative Evaluation Geographical Boundary
with Alnus glutinosa and Fraxinus excelsior (91E0)/Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Pallasgreen, Co. Limerick	
Floating river vegetation (3260)/Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)/Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Killuragh Digester Plant, Pallasgreen, Co. Limerick	Consented development upstream of the River Shannon SAC within the Mulkear River catchment
Floating river vegetation (3260)/Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)/Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Agriculture - Milking Parlour Portnard, Cappamore, Co. Limerick	Consented development upstream of the River Shannon SAC within the Mulkear River catchment
Floating river vegetation (3260)/Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)/Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Housing Developments Annacotty, Co. Limerick	Consented development upstream of the River Shannon SAC within the Mulkear River catchment
Floating river vegetation (3260)/Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0)/Atlantic Salmon (*Salmo salar*)/ Sea	Agriculture Forestry operations	Agriculture and Forestry are the predominant land uses in the area of the Whole UWF Project

REFERENCE DOCUMENT

Qualifying Interest/Special Conservation Interest	**Other Project/Activity**	**Location of Other Project/Activity within the Cumulative Evaluation Geographical Boundary**
Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)		
Otter	Castlewaller Windfarm, Co. Tipperary	Consented windfarm development, of 16 no. turbines. In immediate proximity to the Development.
Otter	Newport Distributor Road	Consented public road development at Newport, Co. Tipperary within the Newport River catchment. The road development is also located upstream of the Lower River Shannon SAC
Lower River Suir SAC (002137)		
Floating river vegetation (3260) Alluvial Forests* (91E0) Freshwater Pearl Mussel White-Clawed Crayfish Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyz-on marinus*) Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Agricultural development, Gortussa, Dundrum, Co. Tipperary	Consented change of use of hay storage to slatted unit for pigs at farm site located within the Multeen River catchment. The agricultural development is also located upstream of the Lower River Suir SAC
Floating river vegetation (3260) Alluvial Forests* (91E0) Freshwater Pearl Mussel White-Clawed Crayfish Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyz-on marinus*) Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Gortnahalla Wind Turbine development, Co. Tipperary	Consented single turbine development within the Clodiagh River catchment. The turbine development is also located upstream of the Lower River Suir SAC
Floating river vegetation (3260) Alluvial Forests* (91E0) Freshwater Pearl Mussel White-Clawed Crayfish Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyz-on marinus*) Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	General agriculture and Forestry operations	Agriculture and forestry are the predominant land uses within the upper Clodiagh, Owenbeg and Multeen East catchment areas of the Whole Windfarm Project

REFERENCE DOCUMENT

Qualifying Interest/Special Conservation Interest	**Other Project/Activity**	**Location of Other Project/Activity within the Cumulative Evaluation Geographical Boundary**
Floating river vegetation (3260) Alluvial Forests* (91E0) Freshwater Pearl Mussel White-Clawed Crayfish Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyz-on marinus*) Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Industrial / warehouse Units, Thurles, Co. Tipperary	Consented Industrial / warehouse Units within the Clodiagh River catchment. The development is also located upstream of the Lower River Suir SAC.
Floating river vegetation (3260) Alluvial Forests* (91E0) Freshwater Pearl Mussel White-Clawed Crayfish Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyz-on marinus*) Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)	Thurles Regional Water Treatment Works	Consented water treatment works abstracting from the Clodiagh River catchment.
Slievefelim to Silvermines Mountain SPA (04077)		
Hen Harrier	Castlewaller Windfarm, Co. Tipperary	Consented windfarm development, of 16 no. turbines. In immediate proximity to the UWF Grid Connection element
Hen Harrier	Bunkimalta Windfarm, Co. Tipperary	Consented windfarm development, <2km to the North of the UWF Grid Connection
Hen Harrier	Forestry and Agriculture	Agriculture and forestry are the predominant land uses in the area of the Whole UWF Project

REFERENCE DOCUMENT

5.3.6.3 Other Projects/Activities located in the Cumulative Evaluation Timeframe Study Area

The Projects/Activities which are located within the Cumulative Evaluation Geographical Boundary were then evaluated for their potential to contribute to cumulative effects on European Sites under consideration within relevant timeframe boundaries associated with the Whole UWF Project (i.e. there is timeframe overlap or it is reasonable to assume that timeframe overlap occurs- a precautionary approach has been taken). This is presented below in Table 5.13.

Table 5.13 Cumulative Evaluation Time-Frame Study Area

Timeframe Study Area - Whole UWF Project lifecycle	Other Plan or Project	Justification for the Timeframe Boundaries
Construction/ Operational Stage Operational stage	Castlewaller Wind Farm	Yes, potential for cumulative effects during the operational stage of the UWF Grid Connection. No potential for effects during the Construction Stage of the UWF Grid Connection as the UWF Grid Connection will be operational before the construction of Castlewaller Windfarm commences. No Decommissioning of UWF Grid Connection
	Castlewaller HHMP	Implementation of Castlewaller Wind Farm HHMP is considered likely to overlap the Operational Period of Whole UWF Project
Construction/ Operation stages	Bunkimalta Wind Farm	Yes, potential for cumulative effects during both the operational stage of the UWF Grid Connection as the Bunkimalta Windfarm could potential be built during the same time period as the Whole UWF Project. No Decommissioning of UWF Grid Connection.
	Bunkimalta HHMP	Implementation of Bunkimalta Wind Farm HHMP is considered likely to overlap the Operational Period of Whole UWF Project
Construction stage	Newport Distributor Road	Potential for cumulative effects during the construction stage of the UWF Grid Connection. No significant in combination effects considered likely during operation or decommissioning of the Development. No impacts on surface water quality or flowseffects on the Lower River Shannon SAC, due to decreases in aquatic habibat quality due to changes in surface water quality or flows, are anticipated during the operational stage or the decommissioning stage of the Gortnahalla Wind Turbine Developmentdevelopment.
Construction stage	Agriculture - Milking Parlour, Bunkey, Lisnagry, Co. Limerick	Potential for cumulative effects during the construction stage of the Whole UWF Project. No Significant in combination effects on European Sites considered likely during operation or decommissioning of the Developmentstages of the Whole UWF Project Elements.
Construction stage	Housing Development Doon , Co. Tipperary	Potential for cumulative effects during the construction stage of the Whole UWF Project. No Significantin combination effects considered likely during operation or decommissioning stages of the Whole UWF Project Elements.
Construction stage	Agricultural sheds and stores, Killuragh, Pallasgreen, Co. Limerick	Potential for cumulative effects during the construction stage of the Whole UWF Project. No Significant in combination effects considered likely during operation or decommissioning stages of the Whole UWF Project Elements.

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Timeframe Study Area - Whole UWF Project lifecycle	Other Plan or Project	Justification for the Timeframe Boundaries
Construction stage	Killuragh Digester Plant, Killuragh, Pallasgreen, Co. Limerick	Potential for cumulative effects during the construction stage of the Whole UWF Project. No Significant in combination effects considered likely during operation or decommissioning stages of the Whole UWF Project Elements..
Construction stage	Agriculture - Milking Parlour, Portnard, Cappamore, Co. Limerick	Potential for cumulative effects during the construction stage of the Whole UWF Project. No Significant in combination effects considered likely during operation or decommissioning stages of the Whole UWF Project Elements.
Construction stage	Housing Development, Annacotty, Co. Limerick	Potential for cumulative effects during the construction stage of the Whole UWF Project. No Significant in combination effects considered likely during operation or decommissioning stages of the Whole UWF Project Elements.
Construction stage	Agricultural development, Gortussa, Dundrum, Co. Tipperary	Potential for cumulative effects during the construction stage of the Whole UWF Project. In relation to the operational or decommissioning stages of the Whole UWF Project, only 2 no. turbines (along with associated access roads) from the Upperchurch Windfarm including ~0.9km of Internal Windfarm Cabling are located within the same local surface water body (Multeen River) as the agricultural development. Due to the relatively small scale of the Whole UWF Project works within the Multeen River catchment, no impacts on surface water quality or flows, and by virtue of any connection, European Sites are anticipated during the operational stage or the decommissioning stage of the project.
Construction stage	Gortnahalla Wind Turbine development, Co. Tipperary	The potential for cumulative effects is limited to the construction stage of the Whole UWF Project. Due to the scale of the single turbine development at Gortnahalla, effects on the Lower River Suir SAC, due to decreases in aquatic habibat quality due to changes in surface water quality or flows, are anticipated during the operational stage or the decommissioning stage of the Gortnahalla Wind Turbine development.
Construction stage	Telecommunications Support Structure, Knocknaharney, Borrisoleigh, Co. Tipperary	Due to the scale of the telecoms development no impacts on surface water quality or flows are anticipated during the operational stage or the decommissioning stage of the Support Structure.
Construction stage	Industrial / warehouse Units, Thurles, Co. Tipperary	Yes potential for cumulative effects during the construction stage of the Whole UWF Project, as the industrial units may potentially be constructed during the same period. Due to the scale, location and nature of the consented Industrial / warehouse units within the Clodiagh River catchment no impacts on surface water quality or flows are anticipated as a result of the operational industrial units are located upstream of the Lower River Suir SAC.
Construction stage	Thurles Regional Water Treatment Works	Yes potential for cumulative effects during the construction stage of the Whole UWF Project, as impacts on surface water

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Timeframe Study Area - Whole UWF Project lifecycle	Other Plan or Project	Justification for the Timeframe Boundaries
		quality or flows by the water treatment works are anticipated during the operational stage of Water Treatment Works.
Construction / Operation/ Decommissioning	Forestry and Agriculture and Turf -cutting	Ongoing in all stages of the Whole UWF Project Elements3 stages.

5.3.6.4 Cumulative Conceptual Site Model

Other plans and projects will generally have the same impact pathways as those described in the Conceptual Site Model for the Whole UWF Project at Stage 1 and carried forward to Stage 2, due to these Other Plans and Projects constituting either renewable energy projects or projects involving civil works. It was considered that there is no potential for cumulative effects with other projects where no likelihood of significant effects from the Whole UWF Project Elements will occur in the first instance.

In the table below, the effects on each Qualifying Interest/Special Conservation Interest under consideration at Stage 2 is examined for likely cumulative effects with other plans or projects, which are either included for further examination and analysis in the following Sections or ruled out from further examination and analysis with justification for same.

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Table 5.14: Conceptual Model for Cumulative Effects on European Sites – Lower River Shannon SAC (002165)

Potential Impact Source Identified	Pathway(s)	Qualifying Interests	Whole UWF Project Elements Impacts	Castlewaller Windfarm Examination for likely cumulative effects	Bunkimalta Windfarm Examination for likely cumulative effects	Newport Distributor Road Examination for likely cumulative effects	Milking Parlour - Bunkey, Lisnagry Examination for likely cumulative effects	Forestry and Agriculture
Land Take/ Reinstatement/Sediment/Movement of Soils/Instream Works/Machinery Movement/Excavation Works/Dewatering of excavations/ Permanent Access Roads and Hardstanding/ Cement based materials/ Hydrocarbons/ Overburden Storage/ Groundworks/ Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)/ Reinstatement (Alluvial forests only)	Soils/ Surface Water Flowpaths/ Movement of Soils/ Surface Water	Floating river vegetation (3260)/ Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0) Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) Otter (Lutra lutra)	Riparian habitat degradation	No:precluded from further evaluation Outside the timeframe boundary. No potential for in combination effects.	No:precluded from further evaluation Construction activities will be at least a minimum of 50m where possible. Separation distance precludes in combination effects.	No:precluded from further evaluation Effects are unlikely to be significant.	No:precluded from further evaluation Effects are unlikely to be significant.	No:precluded from further evaluation Effects are unlikely to be significant.
Land Take/ Reinstatement/ Instream Works/Machinery Movement/ Excavation Works/ Dewatering of excavations/ Drilling/ Noise and Human Disturbance/ Groundworks/Drillin	Surface Water/ Visibility/ Ground and Air Vibrations/ Direct Contact	Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyz-on marinus) Brook Lamprey (Lampetra planeri)/ River Lamprey	Disturbance to Fisheries	No:precluded from further evaluation Outside the timeframe boundary. No potential for in combination effects.	No:precluded from further evaluation Construction activities will be at least a minimum of 50m where possible. Separation distance and cited Sediment Control Plan	No:precluded from further evaluation Effects are unlikely to be significant.	No:precluded from further evaluation Effects are unlikely to be significant.	No:precluded from further evaluation Effects are unlikely to be significant.

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Potential Impact Source Identified	Pathway(s)	Qualifying Interests	Whole UWF Project Elements Impacts	Castlewaller Windfarm Examination for likely cumulative effects	Bunkimalta Windfarm Examination for likely cumulative effects	Newport Distributor Road Examination for likely cumulative effects	Milking Parlour - Bunkey, Lisnagry Examination for likely cumulative effects	Forestry and Agriculture
g Pit Dewatering (Mulkear/Bilboa/Clare Rivers)		(Lampetra fluviatilis)			precludes in combination effects.			
Sediment/Instream works/ Machinery movement;	Surface water; Land cover	Floating river vegetation (3260) Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyz-on marinus) Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) Otter (Lutra lutra)	Changes in Flow Regime	No:precluded from further evaluation Outside the timeframe boundary. No potential for in combination effects.	No:precluded from further evaluation No potential for cumulative morphological effects due to separation; Construction activities will be at least a minimum of 50m where possible.	No:precluded from further evaluation Effects are unlikely to be significant.	No:precluded from further evaluation Effects are unlikely to be significant.	No:precluded from further evaluation Effects are unlikely to be significant.
Instream works; Excavation works	Surface water; Movement of soils and machinery	Floating river vegetation (3260) / Alluvial forests with Alnus glutinosa and Fraxinus excelsior (91E0) Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyz-on marinus) Brook	Spread of aquatic invasive species	No:precluded from further evaluation Outside the timeframe boundary. No potential for in combination effects.	No:precluded from further evaluation Construction activities will be at least a minimum of 50m where possible.	No:precluded from further evaluation Effects are unlikely to be significant.	No:precluded from further evaluation Effects are unlikely to be significant.	No:precluded from further evaluation Effects are unlikely to be significant.

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Potential Impact Source Identified	Pathway(s)	Qualifying Interests	Whole UWF Project Elements Impacts	Castlewaller Windfarm Examination for likely cumulative effects	Bunkimalta Windfarm Examination for likely cumulative effects	Newport Distributor Road Examination for likely cumulative effects	Milking Parlour - Bunkey, Lisnagry Examination for likely cumulative effects	Forestry and Agriculture
		Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) Otter (Lutra lutra)						
Land Take/Reinstatement /Sediment/Movement of Soils/ Instream Works/Machinery Movement/Excavation Works/Dewatering of excavations/Permanent Access Roads and Hardstanding/Cement based materials/Hydrocarbons/Overburden Storage/Groundworks/ Drilling Pit Dewatering (Mulkear/Bilboa/Clare Rivers)	Soils/ Surface Water Flowpaths/ Movement of Soils/ Surface Water	Floating river vegetation (3260) Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus) Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) Otter (Lutra lutra)	Decrease in habitat quality via: surface water runoff, sediment entrainment or release; release of fuels oils/ chemicals, surface/ ground water quality impacts	No:precluded from further evaluation Outside the timeframe boundary. No potential for in combination effects.	No:precluded from further evaluation Construction activities will be at least a minimum of 50m where possible. A sediment control plan will be in place.	No:precluded from further evaluation Effects are unlikely to be significant.	No:precluded from further evaluation Effects are unlikely to be significant.	No:precluded from further evaluation Effects are unlikely to be significant.
Construction Noise and Visual Intrusion	Air and visibility	Otter	Disturbance to Otter	No:precluded from further evaluation	No:precluded from further evaluation	No:precluded from further evaluation	No:precluded from further evaluation	No:precluded from

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Potential Impact Source Identified	Pathway(s)	Qualifying Interests	Whole UWF Project Elements Impacts	Castlewaller Windfarm Examination for likely cumulative effects	Bunkimalta Windfarm Examination for likely cumulative effects	Newport Distributor Road Examination for likely cumulative effects	Milking Parlour - Bunkey, Lisnagry Examination for likely cumulative effects	Forestry and Agriculture
				; None Recorded in Baseline Studies.	Effects are unlikely to be significant.	; Effects are unlikely to be significant.	Effects are unlikely to be significant.	further evaluation ; Effects are unlikely to be significant.

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Table 5.15: Conceptual Site Model for Cumulative Effects on European Sites – Lower River Suir SAC (002137)

Potential Impact Source Identified	Pathway(s)	Qualifying Interest	Whole UWF Project Impacts	Gortnahalla Wind Turbine Scoping for likely cumulative effects	Industrial / warehouse Units – Thurles Scoping for likely cumulative effects	Thurles Regional Water Treatment Works Scoping for likely cumulative effects	Forestry and Agriculture
Land Take/ Reinstatement/Sediment/Movement of Soils/Instream Works/Machinery Movement/Excavation Works/Dewatering of excavations/Permanent Access Roads and Hardstanding/Cement based materials/Hydrocarbons/Overburden Storage/Groundworks	Soils / Direct contact	Floating river vegetation (3260) Atlantic Salmon (*Salmo salar*)/ Sea Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*) / Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)	Riparian habitat degradation	No:precluded from further evaluation Due to the small scale nature of the site, and the large downstream distance from the Whole Windfarm Project (10km), cumulative effects are unlikely to be significant.	No:precluded from further evaluation Due to the small scale nature of the site, and the large downstream distance to where cumulative effects can occur (20km), effects are unlikely to be significant.	No:precluded from further evaluation Due to the small scale nature of the site, and the large downstream distance to where cumulative effects can occur (20km), effects are unlikley to be significant.	No:precluded from further evaluation Effects are unlikely to be significant.
Reinstatement/Sediment/Instream Works/Machinery Movement/Excavation Works/Dewatering of excavations/Groundworks	Surface water; Direct contact; Ground and air vibrations	Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis) / White-clawed Crayfish	Disturbance to/ or Displacement of Aquatic Species	No:precluded from further evaluation It is assumed that the consented development will implement all mitigation measures in full, as prescribed, in order to achieve	No:precluded from further evaluation Due to the small scale nature of the site, and the large downstream distance to where cumulative effects can occur (20km),	No:precluded from further evaluation It is assumed that the consented development will implement all mitigation measures in full, as prescribed, in order to achieve	No:precluded from further evaluation Effects are unlikely to be significant

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Potential Impact Source Identified	Pathway(s)	Qualifying Interest	Whole UWF Project Impacts	Gortnahalla Wind Turbine Scoping for likely cumulative effects	Industrial / warehouse Units – Thurles Scoping for likely cumulative effects	Thurles Regional Water Treatment Works Scoping for likely cumulative effects	Forestry and Agriculture
		(Austropotamobius pallipes) / Freshwater pearl mussel (Margaritifera margaritifera)		the predicted residual impact significance. On this basis, no likley significant effects on downstream water quality are likely to arise which may interact cumulatively with the UWF Whole Project. Furthermore, taking account of the small scale and extent of the Gortnahalla Wind Turbine, and the large downstream distance from the Whole Windfarm Project (10km), cumulative effects are unlikely to be significant.	effects are unlikely to be significant.	the predicted residual impact significance. On this basis, no likley significant effects on water quality are likely to arise which may interact cumulatively with the UWF Whole Project. Furthermore, taking account of the the large downstream distance to where cumulative effects can occur(20km), effects are unlikely to be significant.	
Sediment; Instream works; Machinery movement;	Soils/Surface Water andGroundWater Flowpaths/Landcover/Direct Contact	Floating river vegetation (3260)/ Alluvial forests (91E0) Atlantic Salmon (*Salmo salar*)/ Sea	Changes in Flow Regime	No:precluded from further evaluation It is assumed that the consented development will implement all	No:precluded from further evaluation Due to the small scale nature of the site, and the large downstream	No:precluded from further evaluation It is assumed that the consented development will implement all	No:precluded from further evaluation Effects are unlikely to be significant.

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Potential Impact Source Identified	Pathway(s)	Qualifying Interest	Whole UWF Project Impacts	Gortnahalla Wind Turbine Scoping for likely cumulative effects	Industrial / warehouse Units – Thurles Scoping for likely cumulative effects	Thurles Regional Water Treatment Works Scoping for likely cumulative effects	Forestry and Agriculture
		Lamprey (*Petromyzon marinus*)/ Brook Lamprey (*Lampetra planeri*)/ River Lamprey (*Lampetra fluviatilis*)/ White-clawed crayfish (*Austropotamobius pallipes*)/ Freshwater pearl mussel (*Margaritifera margaritifera*) Otter (*Lutra lutra*)		mitigation measures in full, as prescribed, in order to achieve the predicted residual impact significance. On this basis, no likley significant effects on downstream water quality are likely to arise which may interact cumulatively with the UWF Whole Project. Furthermore, taking account of the small scale and extent of the Gortnahalla Wind Turbine, and the large downstream distance from the Whole Windfarm Project (10km), cumulative effects are unlikely to be significant.	distance to where cumulative effects can occur (20km), effects are unlikely to be significant.	mitigation measures in full, as prescribed, in order to achieve the predicted residual impact significance. On this basis, no likley significant effects on water quality are likely to arise which may interact cumulatively with the UWF Whole Project. Furthermore, taking account of the the large downstream distance to where cumulative effects can occur(20km), effects are unlikely to be significant .	
Movement of soils/Instream	Surface water	Floating river vegetation (3260) /	Spread of Aquatic Invasive Species	No:precluded from further evaluation	No:precluded from further evaluation	No:precluded from further evaluation	No:precluded from further evaluation

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Potential Impact Source Identified	Pathway(s)	Qualifying Interest	Whole UWF Project Impacts	Gortnahalla Wind Turbine Scoping for likely cumulative effects	Industrial / warehouse Units – Thurles Scoping for likely cumulative effects	Thurles Regional Water Treatment Works Scoping for likely cumulative effects	Forestry and Agriculture
Works/Machinery Movement		Alluvial forests (91E0) Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus)/ Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis)/ White-clawed crayfish (Austropotamobius pallipes)/ Freshwater pearl mussel (Margaritifera margaritifera) Otter (Lutra lutra)		Due to the small scale nature of the site, and the large downstream distance from the Whole Windfarm Project (10km), cumulative effects are unlikely to eb significant.	Due to the small scale nature of the site, and the large downstream distance to where cumulative effects can occur (20km), effects are unlikely to eb significant.	Due to the small scale nature of the site, and the large downstream distance to where cumulative effects can occur (20km), effects are unlikely to eb significant.	Effects are unlikely to be significant.
Movement of soils/Instream Works/Machinery Movement/Excavation Works/Forestry Felling/Hydrocarbons/Reinstatement/ Overburden Storage/Sediment/ Use of Cement Based Compounds/Perma	Surface water and Ground Water Flowpaths/Soil	Floating river vegetation (3260) Atlantic Salmon (Salmo salar)/ Sea Lamprey (Petromyzon marinus) Brook Lamprey (Lampetra planeri)/ River Lamprey (Lampetra fluviatilis)/ White-clawed crayfish	Decrease in habitat quality via: surface water runoff, sediment entrainment or release; release of fuels oils/ chemicals, surface/ ground water quality impacts	No:precluded from further evaluation It is assumed that the consented development will implement all mitigation measures in full, as prescribed, in order to achieve the predicted residual impact	No:precluded from further evaluation Due to the small scale nature of the site, and the large downstream distance to where cumulative effects can occur (20km), effects are unlikely to be significant.	No:precluded from further evaluation It is assumed that the consented development will implement all mitigation measures in full, as prescribed, in order to achieve the predicted residual impact	No:precluded from further evaluation Effects are unlikely to be significant.

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Potential Impact Source Identified	Pathway(s)	Qualifying Interest	Whole UWF Project Impacts	Gortnahalla Wind Turbine Scoping for likely cumulative effects	Industrial / warehouse Units – Thurles Scoping for likely cumulative effects	Thurles Regional Water Treatment Works Scoping for likely cumulative effects	Forestry and Agriculture
nent Access Roads and Hardstanding/Dewatering of excavations		(Austropotamobius pallipes)/ Freshwater pearl mussel (Margaritifera margaritifera) Otter (Lutra lutra)		significance. On this basis, no likely significant effects on downstream water quality are likely to arise which may interact cumulatively with the UWF Whole Project. Furthermore, taking account of the small scale and extent of the Gortnahalla Wind Turbine, and the large downstream distance from the Whole Windfarm Project (10km), cumulative effects are unlikely to be significant.		significance. On this basis, no likely significant effects on water quality are likely to arise which may interact cumulatively with the UWF Whole Project. Furthermore, taking account of the the large downstream distance to where cumulative effects can occur (20km), effects are unlikely to be significant.	

REFERENCE DOCUMENT

Table 5.16: Conceptual Site Model for Cumulative Impacts- Slievefelim to Silvermines SPA (004077

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Source(s) of Biodiversity Impacts	Pathway(s)	Special Conservation Interest	Whole UWF Project Impacts	Castlewaller Windfarm Scoping for likely cumulative effects	Bunkimalta Wind Farm Scoping for likely cumulative effects	Forestry/Agriculture/Turf-cutting Scoping for likely cumulative effects
Hen Harrier						
Land Use Change	Land Cover	Hen Harrier	Reduction in or Loss of suitable or potentially suitable Hen Harrier Foraging Habitat	Yes –Scoped In	Yes-Scoped In	Yes- Scoped In
Forestry Felling/ Operating Machinery	Contact	Hen Harrier	Inadvertant Mortality of Hen Harrier in or at Nest or Roost Sites	No- It is assumed that measures to prevent harmful effects on Hen Harrier as conditioned in planning will be implemented. No winter roosting is described. No likelihood of significant effects.	No- It is assumed that measures to prevent harmful effects on Hen Harrier as described in the SHMP and relevant reporting such as the submitted NIS and conditioned in planning will be implemented. No likelihood of significant effects.	Yes – Forestry Scoped In No – Agriculture & Turbary Agricultural Activities will not overlap potential breeding or roosting habitats. Restrictions on further turf cutting in intact areas/protected areas, and; the limited extent of suitable turbary habitat within the Hen Harrier SPA overall (4%) results in no likelihood of significant cumulative effects.
Noise and Human Activity	Visibility	Hen Harrier	Disturbance / Displacement of Nesting / Roosting Hen Harrier	No- It is assumed that measures to prevent harmful effects on Hen Harrier as conditioned in planning will be implemented. No winter roosting is described. No likelihood of significant effects.	No- Construction works will be confined to times outside the main breeding season to avoid disturbance to birds. Monitoring and mitigation measures during operation in the event a breeding territory is found within 500m of a turbine will avoid disturbance to breeding birds. No winter roosting is described. No likelihood of significant effects.	Yes- Forestry Scoped In No – Agriculture & Turbary Agricultural Activities will not overlap potential breeding or roosting habitats.Restrictions on further turf cutting in intact areas/protected areas, and; the limited extent of suitable turbary habitat within the Hen Harrier SPA overall (4%) results in no likelihood of significant cumulative effects.

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5.3.6.5 Evaluation of Effects (In Combination)

The following Tables evaluate the identified effects **(in combination)** on Key Habitats and Species within the context of European Sites for which linkage exists.

Following conceptual modelling, pathways for likely significant in combination effects with other plans and projects have only been established in respect of the Slieve Felim to Silvermines SPA.

In relation to the above SPA, notwithstanding those potential effects via disturbance and inadvertent mortality are completely dealt with through Project Design, in the interest of clarity an evaluation of the identified in combination pathways is also presented in the following tables.

REFERENCE DOCUMENT

Slievefelim to Silvermines SPA (004077)

Hen Harrier: Reduction in or Loss of suitable or potentially suitable Hen Harrier Foraging Habitat

Table 5.17 Hen Harrier: Reduction in or Loss of suitable or potentially suitable Hen Harrier Foraging Habitat (In combination)

Cumulative Impact:	**Reduction in or Loss of suitable or potentially suitable Hen Harrier Foraging Habitat**
Land Use Change during the construction stage may cause secondary effects such as a reduction in or loss of suitable foraging habitat for Hen Harrier. Permanent loss of high value foraging habitat may cause short term reductions in breeding success if located proximal to a preferred nest location; longer term loss of high value foraging habitat may affect breeding output and/or cause territory abandonment (worst case) with resultant additive intra-specific competition. When added to the effects of other developments or activities, synergistic effects may occur.	
Hen Harrier: Reduction in or Loss of suitable or potentially suitable Hen Harrier Foraging Habitat Individual Project/Activity effects (Pre-mitigation)	
Whole UWF Project Source: Land Use Change Pathway: Land Cover Life Cycle Stage: Construction Whole UWF Project Effect Magnitude: Both positive and negative quality effects occur with regard to Hen Harrier foraging Habitat loss across the Whole UWF Project. The possibility of significant effects via permanent exclusion of Hen Harrier from suitable or potentially suitable foraging habitats within the SPA is only in the order of the grid connection project element. Remaining project elements will not contribute to the exclusion of SPA lands from foraging by Hen Harrier, and certain activities such as the Upperchurch Hen Harrier Scheme are anticipated to have a positive effect on Hen Harrier, however this is not relied on herein as a determinant of significance in terms of effects on European Sites. In respect of the UWF Grid Connection project element, project design measures implemented at source will ensure that no Hen Harrier are permanently excluded from currently suitable or potentially suitable lands. All re-instatement will be immediate and thus avoid the potential for cumulative sequential effects during the construction period. Significance: No adverse effect on Site Integrity due to: 1. There will be no permanent exclusion of Hen Harrier from currently suitable or potentially suitable foraging lands within the SPA, thus ensuring; 2. The constitutive characteristics of the European Site will remain viable, as a result of; 3. Avoidance of effects by virtue of separation distance (Project elements 3,4 and 5), and; 4. Avoidance of effects at source in respect of Project Element 1 through Project Design preventative measures, and; 5. Avoidance of effects at source, through avoidance in respect of Project Element 2; 6. Conservation Objectives will not be undermined.	

REFERENCE DOCUMENT

Castlewaller Windfarm

Source: Land Use Change
Pathway: Land Cover
Life Cycle Stage: Construction

Castlewaller Windfarm Effect Magnitude:
Effective Habitat Loss of Hen Harrier habitat within 250m of each turbine location, where harriers use second rotation aged 3-9 years-estimated at 47.9Ha.[13] However the applicant also proposes to manage 47.9Ha of clear felled woodland for the lifetime of the windfarm for the benefit of Hen Harrier.

Significance: [14]
Based on the information presented in the RFI documentation, the effect on European Sites under consideration is evaluated as '**not significant'**.

Bunkimalta Windfarm

Source: Land Use Change
Pathway: Land Cover
Life Cycle Stage: Construction

Bunkimalta Windfarm Effect Magnitude[15]:
"The SHMP acknowledges that Hen Harriers may show avoidance around 250m of each turbine. A total area of 162.76 hectares must be replaced by mitigation measures. DAHG cites this figure also."

As the residual effects presented in the Windfarm EIS were subject to substantive discussion subsequent to decision, we do not cite these; rather we cite the relevant text from the inspectors Report. The comments below refer to the loss of foraging habitat within the context of Conservation Objectives for the (Hen Harrier) SPA, as cited in the Inspectors Report for Bunkimalta Wind Farm:
Pg. 34
"In summary therefore I conclude that the relevant matter is that there is a proposed total mitigatory habitat of 164.3 hectares which compares favourably with the 162.76 hectares lost. Subject to the Board being satisfied that the management of the 137.3 hectares of perpetual open canopy forest under the SHMP will provide suitable Hen Harrier habitat then the Board can be satisfied that the development would be in accordance with the conservation objective for the SPA." and;
Pg.41
"Based on the available information, which includes best scientific evidence and which is adequate for the purposes of Appropriate Assessment; I consider that the development would not result in net loss of Hen Harrier habitat. Therefore, I conclude that the Board can be satisfied that the development would not significantly affect the integrity of the SPA having regard to its Conservation Objective".

Significance:

Based on an evaluation of "no net loss" the effect on European Sites under consideration is evaluated as '**not significant'**.

[13] Castlewaller Woodland Partnership (2007). Response to RFI from North Tipperary County Council prepared by Fehily Timoney and Company

[14] Castlewaller Woodland Partnership (2007). Response to RFI from North Tipperary County Council prepared by Fehily Timoney and Company

[15] An Bord Pleanála (2013) Inspectors Report for Bunkimalta Wind Energy Project PL.22.241924

Forestry

Source: Land Use Change
Pathway: Land Cover
Life Cycle Stage: Afforestation/Growth Stage

Effect Magnitude:
Hen Harrier in Ireland makes extensive use of both first and second rotation pre-thicket forest habitat during the breeding period. However by its successional nature forests inevitably matures and become less suitable (Avery & Leslie, 1990; Madders, 2000; 2003; O'Donoghue, 2004).

The following is cited directly from the document titled "Hen Harrier Conservation and the Forestry Sector in Ireland", published by NPWS in 2015:
"Forests less than 15 years old constitute to varying degrees a potential foraging resource for Hen Harriers. In line with the forecasted reduction in the extent of the forest nesting resource, indicative future estimates of the extent of the potential *forest foraging* resource within the SPA network shows an acute declining trend over the next 10 years[16]"(emphasis added). This negative trend is also applicable to the Slieve Felim to Silvermines Mountains SPA.

It is likely that some sites within the 'wider countryside' areas supporting breeding Hen Harrier that have been afforested will also experience forestry related changes both due to the maturation of existing forest habitat and the conversion of currently useful habitat (e.g. scrub, low intensity managed farmland) to a less stable state.

Significance:
Evaluated as **likely to be significant** on a precautionary basis.

Agriculture

Source: Land Take
Pathway: Land Cover
Life Cycle Stage: ALL

Effect Magnitude:
Little or no information is available on current trends in agriculture.

Significance:
In relation to Agriculture, in the absence of available information on trends it is evaluated as Neutral.

Turbary

Source: Land Take
Pathway: Land Cover
Life Cycle Stage: Harvesting

Effect Magnitude:
Habitats possibly subject to Peat Extraction such as Upland Blanket Bog (335Ha or 1.61% of the SPA) and Cutover Bog (507Ha or 2.42% of the SPA) occur within or in close proximity to the Development. Peat extraction by hand or through mechanical means is ranked as a medium level pressure in respect of Hen Harrier within the SPA.

[16] NPWS.2015. Hen Harrier Conservation and the Forestry Sector in Ireland.

REFERENCE DOCUMENT

Some of these habitats where they overlap the SPA are further protected through the provision of NHA's wherein further turf cutting of intact areas is unlawful, or SAC's wherein Conservation Objectives to protect Qualifying Interest bog are set out.
In closer proximity to the Development, turf extraction forms part of the current baseline environment at Bleanbeg Bog but is limited to existing banks and further cutting of intact (uncut) areas, in addition to land take from other activities such as infrastructure, material removal etc. is, as already described unlawful[17].

Significance:
Evaluated as **not significant,** due to;

7. Restrictions on further turf cutting in intact areas/protected areas, and;
8. The limited extent of suitable *turbary* habitat within the Hen Harrier SPA overall (4%), and;
9. The reversibility of any effect, (in the context of Hen Harrier) with birds expected to continue to utilise re-vegetating cutover bog *for foraging*.

Hen Harrier: Reduction in or Loss of Suitable Foraging Habitat

Cumulative Impacts

Evaluation of the cumulative impact of Whole UWF Project AND Other Projects / Activities

Source: Land Take
Pathway: Land Cover
Life Cycle Stage: Construction

Cumulative Effect Magnitude:
There is foraging habitat negative land use change resulting from the development of Castlewaller Wind Farm and Bunkimalta Wind Farm. Notwithstanding the respective management put forward to mitigate these effects (which is not relied upon herein); given the measures applied at source in respect of the Whole UWF Project, within the SPA, to avoid the exclusion of Hen Harrier from foraging habitat; no cumulative effects will accrue.

A significant negative effect rating is utilised for predicted reductions in forestry based foraging habitat in the next 10 years, with the effects of peat extraction on foraging habitat evaluated as neutral or not significant therefore in the context of European Sites.

Significance: No adverse effect on Site Integrity due to:

1. The preventative measures applied at source as part of the Whole UWF project to avoid the exclusion of Hen Harrier from foraging habitat, and;;
2. Reductions in forestry foraging habitat (considered likely to be in line with existing or emerging trends) therefore;
3. A neutral- positive effect on Hen Harrier will accrue, and;
4. Conservation Objectives in respect of Hen Harrier will not be undermined.

[17] http://www.irishstatutebook.ie/eli/2005/si/497/made/en/print

REFERENCE DOCUMENT

Slievefelim to Silvermines SPA (004077

Inadvertant Mortality of Hen Harrier in or at Nest or Roost Sites

Table 5.18 Hen Harrier: Inadvertant Mortality of Hen Harrier in or at Nest or Roost Sites (In combination)

Cumulative Impact:	**Inadvertant Mortality of Hen Harrier in or at Nest or Roost Sites**

Hen Harrier: Inadvertant Mortality of Hen Harrier in or at Nest or Roost Sites
Individual Project/Activity effects

Whole UWF Project

Source: Forestry Felling/Operating Machinery
Pathway: Contact
Life Cycle Stage: Construction/Operation

Whole UWF Project Effect Magnitude:
The order of effect is essentially the UWF Grid Connection which is the Project Eelement where works will primarily occur within the zone of effect for inadvertent mortality. Both nesting and winter roost Hen Harrier occur along this route of the 110kV UGC. Project design Measures will avoid mortality effects at source, including cumulative effects from multiple sources being present at any given time, as the measures to be employed will prevent multiple work locations being operational at any instance within the specified distance of a nest or winter roost.

Significance: No adverse effect on Site Integrity due to;

1. Project Design Measures being implemented to protect nesting and winter roosting Hen Harrier ensures;
2. Conservation Objectives will not be undermined;

Forestry

Source: Land Take
Pathway: Land Cover
Life Cycle Stage: Felling/Afforestation

Effect Magnitude:
Hen Harrier in Ireland makes extensive use of both first and second rotation pre-thicket forest habitat during the breeding period. However by its successional nature forests inevitably matures and become less suitable (Avery & Leslie, 1990; Madders, 2000; 2003; O'Donoghue, 2004).

The following is cited directly from the document titled "Hen Harrier Conservation and the Forestry Sector in Ireland", published by NPWS in 2015:

"Harrier nests may be impacted by forestry related activities in the future. Forest Service Red Areas have been in operation within SPAs for a number of years. This approach is a positive way of minimising the risk of nest failures due to forestry related activities within the SPAs.
The location and distribution of nesting Hen Harrier can vary between years. Nest site distribution is likely to change in response to changing forest structure in heavily forested landscapes. As the current Red Areas are largely based on data collected during the period 2005 – 10 these zones become more outdated

as the years progress. Revising these zones based on updated data in the future and extending this approach to other areas outside of the SPA network that are of importance to breeding Hen Harrier would reduce the risk of this pressure."

In addition in respect of winter roost data and potential affects from afforestation, lacunae in respect of locations of winter roosts is acknowledged in determining the effects of afforestation on Hen Harrier.

Significance:
Evaluated as **likely to be significant** on a precautionary basis.

Hen Harrier: Inadvertant Mortality of Hen Harrier in or at Nest or Roost Sites
Cumulative Impacts
Evaluation of the cumulative impact of Whole UWF Project AND Other Projects / Activities

Source:
Pathway:
Life Cycle Stage:

Cumulative Effect Magnitude:

A significant negative effect rating is utilised for predicted effects from forestry activities, notwithstanding the Coillte Red Zones project, limitations are acknowledged in predicted locations of nesting and roosting birds from year to year.

Notwithstanding this, the implementation of preventative measures at source within the SPA as part of the Project Design of the development avoids cumulative effects.

Significance: No adverse effect on Site Integrity due to;
;

1. Project Design measures being implemented to protect nesting and winter roosting Hen Harrier ensures that, notwithstanding;
2. A significant negative effect rating in respect of forestry related activities, ensures;
3. Conservation Objectives will not be undermined via the identified cumulative source-impact pathway.

REFERENCE DOCUMENT

Slievefelim to Silvermines SPA (004077

Disturbance / Displacement of Nesting / Roosting Hen Harrier

Table 5.19 Disturbance / Displacement of Nesting / Roosting Hen Harrier (In combination)

Cumulative Impact:	**Disturbance / Displacement of Nesting / Roosting Hen Harrier**
Hen Harrier: Disturbance / Displacement of Nesting / Roosting Hen Harrier Individual Project/Activity effects	

Whole UWF Project

Source: Noise and Human Activity
Pathway: Visibility
Life Cycle Stage: Construction/Operation

Whole UWF Project Effect Magnitude:
The UWF Grid Connection is the primary sources of effects as construction works areas and Joint Bay locations will be located within the zone of effect for disturbance. Both nesting and winter roost Hen Harrier occur along the route of the 110kV UGC. Project design measures will avoid disturbance effects at source, including cumulative effects, as the measures to be employed will automatically prevent multiple work locations being operational at any given time within the specified distance of a nest or winter roost.These will also apply to any monitoring activities within the SPA.

Significance: No adverse effect on Site Integrity due to:

1. Project Design measures being implemented to protect nesting and winter roosting Hen Harrier ensures;
2. Conservation Objectives will not be undermined.

Forestry

Source: Land Take
Pathway: Land Cover
Life Cycle Stage: Felling/Afforestation

Effect Magnitude:
Hen Harrier in Ireland makes extensive use of both first and second rotation pre-thicket forest habitat during the breeding period. However by its successional nature forests inevitably matures and become less suitable (Avery & Leslie, 1990; Madders, 2000; 2003; O'Donoghue, 2004).

The following is cited directly from the document titled "Hen Harrier Conservation and the Forestry Sector in Ireland", published by NPWS in 2015:

"Harrier nests may be impacted by forestry related activities in the future. Forest Service Red Areas have been in operation within SPAs for a number of years. This approach is a positive way of minimising the risk of nest failures due to forestry related activities within the SPAs.
The location and distribution of nesting Hen Harrier can vary between years. Nest site distribution is likely to change in response to changing forest structure in heavily forested landscapes. As the current Red Areas are largely based on data collected during the period 2005 – 10 these zones become more outdated as the years progress. Revising these zones based on updated data in the future and extending this

REFERENCE DOCUMENT

approach to other areas outside of the SPA network that are of importance to breeding Hen Harrier would reduce the risk of this pressure."

In addition in respect of winter roost data and potential affects from afforestation, lacunae in respect of locations of winter roosts is acknowledged in determining the effects of afforestation on Hen Harrier.

Significance:
Evaluated as **likely to be significant** on a precautionary basis.

Hen Harrier: Inadvertant Mortality of Hen Harrier in or at Nest or Roost Sites
Cumulative Impacts
Evaluation of the cumulative impact of Whole UWF Project AND Other Projects / Activities

Source:
Pathway:
Life Cycle Stage:

Cumulative Effect Magnitude:

A significant negative effect rating is utilised for predicted effects from forestry activities, notwithstanding the Coillte Red Zones project, limitations are acknowledged in predicted locations of nesting and roosting birds from year to year and a precautionary approach has been taken.

Notwithstanding this, the implementation of preventative measures at source as part of the Project Design of the development avoids cumulative effects.

Significance: : No adverse effect on Site Integrity due to:

1. Project Design measures being implemented to prevent disturbance to nesting and winter roosting Hen Harrier ensures that, notwithstanding;
2. A significant negative effect rating in respect of forestry related activities, ensures;
3. Conservation Objectives will not be undermined via the identified cumulative source-impact pathway.

REFERENCE DOCUMENT

5.3.7 Potential Impacts on the Integrity of the Sites

From the information presented in Section 5.3.7 above, the integrity of the Lower River Shannon (alone) could be indirectly affected by the UWF Grid Connection project element of the Whole UWF Project as a result of disturbance/displacement to Otter during construction - in particular during drilling operations and works on watercourse crossings.

Disturbance or displacement effects could result in secondary additive/synergistic effects from the displacement of individual otters, which may then compete with other individuals possibly resulting in population level effects, reduced distribution (through effective displacement) and hence undermine Conservation Objectives , through either a decline in the extent of terrestrial habitat available within the 10m terrestrial buffer above the High Water Mark and along river banks (through effective displacement), or a reduction in the number of Couching sites and holts (again through displacement) or disturbance along commuting routes (barriers to connectivity).

Table 5-20. Extracted Conservation Objectives in respect of Otter within the Lower River Shannon (not exhaustive).

Attribute	Measure	Target	Notes
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 596.8ha above high water mark (HWM); 958.9ha along river banks/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)
Barriers to connectivity	Number	No significant increase. For guidance, see map 17	Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed 07

Taking account of the Project Design Measures and the scale and nature of the proposed works associated with the Elements of the Whole UWF Project, and with reference to the sensitivities of the Qualifying Interests and Special Conservation Interests, no other identified effects have the potential to result in adverse effects on the integrity of the European Sites under consideration having regard to their respective Conservation Objectives.

5.3.8 Additional Mitigation Measures to be introduced

Mitigation measures to be introduced in respect of disturbance to Otter is as follows and will be a contractual obligation for the appointed contractor.

Lower River Shannon SAC (002165) and Lower River Suir SAC (002137): Otter

Disturbance of or Displacement to Otter

Additional Mitigation Measure Sheet			
Title:	Disturbance and/ or displacement of breeding and/or foraging Otter	**Ref:**	**AMM-01**
Development Phase	During construction	**Work Sections/Locations**	All Watercourse Crossing locations
Environmental Commitment	To avoid likely significant effects of disturbance/displacement of breeding and foraging Otters (and hence European Sites) throughout the construction phase of the Whole UWF Project, and in particular the Grid Connectionthe UWF Grid Connection.		
Roles & Responsibilities			
Construction Manager	• Scheduling of construction activities		
Project Ecologist	• Confirmatory survey for active Otter holts and activity in line with Best Practice as already described as part of Project Design • Oversight of both Project Design measures and additional mitigation as described herein; • The Project Ecologist shall ensure adherence to the following best practice guidance: 5. National Roads Authority (2006). Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes. The National Roads Authority, Dublin. 6. National Roads Authority (2008.) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. The National Roads Authority, Dublin. 7. Highways Agency (1999). Design Manual for Roads and Bridges - Nature Conservation Advice in Relation to Otters HA81/99. The Highways Agency, London.		
Mitigation Measures			
Measure Objective	Avoid disturbance to or displacement to breeding or foraging Otter and hence European Sites during construction		

- Existing Project Design Measures:
- Confirmatory survey for active Otter holts and activity in line with Best Practice (particularly holts at which breeding females or cubs are present) will be undertaken 150m upstream and downstream of watercourse crossing points in line with NRA (2006) and Highways Agency (1999) guidance. This survey will determine the current status of areas where Otter activity was recorded in the pre-planning surveys (i.e. active or inactive) and to determine if any new holts/couches have been established in the intervening period between the initial pre-planning surveys and the commencement of construction activity. These surveys are required to be undertaken no more than 10-12 months in advance of proposed construction activities (NRA, 2006).
- If an active holt (particularly holts at which breeding females or cubs are present) is located within 150 meters of the watercourse crossing points, no works will be undertaken *while cubs are present in the holt* and NPWS will be notified immediately;

REFERENCE DOCUMENT

- All construction works will be carried out during daylight hours
- All construction works within 150m of an active otter holt, will be carried out during daylight hours and outside of 2 hours after sunrise or before sunset during summer/outside of 1 hour after sunrise or before sunset during winter.
- No wheeled or tracked vehicles (of any kind) will be used within 20m of active, but non-breeding otter Holts, and light work, such as digging by hand or scrub clearance will not take place within 15m of such holts, except under license.
- The prohibited working area associated with otter holts will, where appropriate, be fenced with temporary fencing prior to any possibly invasive works and declared as 'out of bounds'. Fencing will be in accordance with Clause 303 of the NRA's Specification for Roadworks (National Roads Authority). Appropriate awareness of the purpose of the enclosure will be conveyed through toolbox talks with site staff and sufficient signage will be placed on each exclusion fence. All contractors or operators on site will be made fully aware of the procedures pertaining to each affected holt (NRA, 2006) and subject to audits and non-conformance records in the event of non-compliance, to be included in reports submitted to Local Authorities and relevant statutory Consultees.

Further Additional Mitigation Measures:

- Surveys will be undertaken by an experienced otter surveyor, and will include a systematic search for spraints, paw prints, otter paths, slides, food remains, holts and places used for shelter in addition to locations of regularly used paths and areas of overland 'shortcuts' used by Otter where meanders occur.
- There are no seasonal constraints for otter surveys, but any dense vegetation (especially in summer) can reduce success in the identification of otter Holts or couches. (NRA, 2006). Surveys may also be unreliable if undertaken during or immediately following periods of high flow or after heavy rain, heavy leaf fall or heavy frost and snow, since many field signs may have been washed away or obscured. All surveys will be timed with due cognizance to the above.
- Note: The Project Ecologist will communicate all confirmatory survey results and information to the senior construction team as and when they arise at the weekly EHS meeting. This information will also be issued to the Local Authority and relevant statutory consultees, as agreed at the consenting stage;
- As per NRA (2006) guidelines, following consultation with NPWS, works closer to identified holts (not containing cubs – we note that no works will take place at watercourse crossings within 150m of holts containing cubs) may take place – provided appropriate mitigation measures are in place; Measures will include screening (screen fencing or planted vegetation) and/or restricted working hours on site as described above. The installation of all screen fencing or planted vegetation will be overseen by the Project Ecologist.
- Where holts are present in close proximity to invasive construction works, but are determined not to require destruction, construction works may commence once mitigation measures to address otters have been complied with (NRA, 2006); compliance will be confirmed by the Project Ecologist;
- In the case of a holt containing cubs; works shall only commence once the project ecologist has confirmed that the holt has been vacated;
- In the event destruction of a holt is required (considered unlikely), one or more artificial holts made from logs, boulders or pipes to tried and tested designs will be provided as appropriate (SNH 2017).
- The location selection and installation of these will be monitored by an appropriately qualified ecologist both pre- and post-installation.
- A report on both Confirmatory Surveys and implemented mitigation measures will be completed by suitably experienced ecologists and will be issued to the relevant competent authority and NPWS via the Developer.
- Post Construction monitoring of Otters will be undertaken on a yearly basis for years 1 to3 inclusive post construction to confirm activity levels post construction and will include monitoring of any artificial holts;

REFERENCE DOCUMENT

- Surveys will include a systematic search for spraints, paw prints, otter paths, slides, food remains, holts and places used for shelter in addition to locations of regularly used paths and areas of overland 'shortcuts' used by Otter where meanders occur.
- An annual report, during construction and during years 1 to 3 post construction, will be issued to the Local Authority and relevant statutory consultees evaluating the results of this survey, and the success of mitigation within the context of the Conservation Objectives of European Sites under consideration

References

- National Roads Authority (2006). Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes. The National Roads Authority, Dublin.
- National Roads Authority (2008.) Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. The National Roads Authority, Dublin.
- Highways Agency (1999). Design Manual for Roads and Bridges - Nature Conservation Advice in Relation to Otters HA81/99. The Highways Agency, London.
- Scottish Natural Heritage (SNH) Otters and Development: Scottish Wildlife Series. http://www.snh.org.uk/publications/on-line/wildlife/otters/mitigation.asp
- Scottish Natural Heritage (SNH) PROTECTED SPECIES ADVICE FOR DEVELOPERS. https://www.snh.scot/sites/default/files/2017-07/A1959316%20-%20Species%20Planning%20Advice%20Project%20-%20otter%20-%20FINAL.pdf

REFERENCE DOCUMENT

5.3.9 Efficacy of the Environmental Protection Measures

The efficacy of the environmental protection measures is described below.

The Additional Mitigation Measure, provided above, has been have been developed from and will adhere to Best Practice documentation as follows:

5.3.9.1 Compliance Efficacy of Additional Mitigation Measure AMM-01

The Additional Mitigation Measure, provided above, has been been developed from and will adhere to the following Standard Guidelines and Best Practice documentation:

- National Roads Authority (2006); Guidelines for the Treatment of Otters prior to the Construction of National Road Schemes. The National Roads Authority, Dublin.
- National Roads Authority (2008.); Ecological Surveying Techniques for Protected Flora and Fauna during the Planning of National Road Schemes. The National Roads Authority, Dublin.
- Highways Agency (1999); Design Manual for Roads and Bridges – Nature Conservation Advice in Relation to Otters HA81/99; The Highways Agency, London.
- Scottish Natural Heritage (SNH); Otters and Development: Scottish Wildlife Series. http://www.snh.org.uk/publications/on-line/wildlife/otters/mitigation.asp
- Scottish Natural Heritage (SNH) protected Protected species Species advice Advice for developersDevelopers. https://www.snh.scot/sites/default/files/2017-07/A1959316%20-%20Species%20Planning%20Advice%20Project%20-%20otter%20-%20FINAL.pdf;

5.3.9.2 Efficacy of the Project Design Measures, Best Practice Measures and Management Plans

The Project Design Measures, Best Practice Measures and Management Plans (including Emergency Response Measures), listed in Section 5.3.1 to Section 5.3.4 inclusive, have been developed using best practice and will adhere to the following Standard Guidelines and Best Practice documentation: We refer the appended Construction Phase Surface Water Management Plans (Tab 4 of the EMP's included as Appendix A9 and A10, and plans included as Appendix A16 in respect of Upperchurch Windfarm for detail on relevant leglisation, guidance and literature from which drainage and water quality measures have been derived. These include as follows:

- Water Framework Directive (2000/60/EC);
- Local Government (Water Pollution) Act, 1977–1990;
- Water Quality (Dangerous Substances) Regulations, 2000;
- Arterial Drainage Act, 1945;
- S.I. No. 41 of 1999 Protection of Groundwater Regulations, resulting from EU Directive 80/68/EEC on the protection of groundwater against pollution caused by certain dangerous substances (the Groundwater Directive);
- S.I. No. 249 of 1989 Quality of Surface Water Intended for Abstraction (Drinking Water), resulting from EU Directive 75/440/EEC concerning the quality required of surface water intended for the abstraction of drinking water in the Member States (repealed by 2000/60/EC in 2007);
- S.I. No. 439 of 2000 Quality of Water intended for Human Consumption Regulations and S.I. No. 122 of 2014 European Communities (Drinking Water) Regulations;
- S.I. No. 272 of 2009 European Communities Environmental Objectives (Surface Waters) Regulations; and,
- S.I. No. 9 of 2010 European Communities Environmental Objectives (Groundwater) Regulations 2010;
- Inland Fisheries Ireland (2016) Guidelines on Protection of Fisheries during Construction Works in and Adjacent to Waters;
- NRA (2008) Guidelines for the Crossing of Watercourses during the Construction of National Road Schemes; and,
- Requirements for the Protection of Fisheries Habitat during Construction and Development Works at River Sites. Eastern Regional Fisheries Board;

REFERENCE DOCUMENT

- PPG01 General guide to the prevention of water pollution;
- PPG02 Above ground oil storage tanks;
- PPG05 Works in near or liable to affect watercourses;
- PPG06 Working at construction and demolition sites;
- PPG07 Refuelling Facilities;
- PPG11 Preventing pollution at industrial sites;
- PPG18 Control of spillages and fire fighting run-off;
- PPG20 Dewatering underground ducts and chambers;
- PPG21 Pollution Incident Response Planning;
- PPG23 Maintenance of Structures over Water; and,
- PPG26 Pollution Prevention Storage and Handling of Drums & Intermediate Bulk Containers.
- CIRIA Report C502 Environmental Good Practice on Site;
- CIRIA Report C532 Control of Water Pollution from Construction Sites;
- CIRIA Report C648 Control of Pollution from Linear Construction Project; Technical Guidance;
- CIRIA Handbook C650 Environmental good practice on site;
- CIRIA Handbook C651 Environmental good practice on site checklist;
- CIRIA Report C609 -– SuDS – hydraulic, structural & water quality advice; and,
- CIRIA Report C697 – The SuDS Manual;
- Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Forest Service (not dated): Forestry and Freshwater Pearl Mussel Requirements – Site Assessment & Mitigation Measures. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford;
- COFORD (2004): Forest Road Manual – Guidelines for the design, construction and management of forest roads.
- Forestry Commission (2004): Forests and Water Guidelines, Fourth Edition. Publ. Forestry Commission, Edinburgh;
- Coillte (2009): Forest Operations & Water Protection Guidelines;
- Forest Services (Draft) Forestry and Freshwater Pearl Mussel Requirements – Site Assessment and Mitigation Measures; and,
- Forest Service (2000): Forestry and Water Quality Guidelines. Forest Service, DAF, Johnstown Castle Estate, Co. Wexford.
- EMP for UWF Grid Connection, Section 6: Environmental Emergency Procedure for Oil/Fuel Spillage
- The Planning System and Flood Risk Management Guidelines (DoEHLG, 2009).
- OPW (2013) Construction, Replacement or Alteration of Bridges and Culverts.
- Scottish National Heritage (2014) Survey Methods for Use in Assessing the Impacts of Onshore Windfarms on Bird Communities http://www.snh.gov.uk/docs/C278917.pdf.
- Ruddock and Whitfield (2007) A Review of Disturbance Distances in Selected Bird Species. A report from Natural Research (Projects) Ltd to Scottish Natural Heritage. http://www.snh.org.uk/pdfs/strategy/renewables/BIRDSD.pdf
- National Roads Authority (2010). Guidelines on the Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads. National Roads Authority, Dublin.
- EMP for UWF Grid Connection - Invasive Species Management Plan.
- Statutory provisions in relation to breeding birds, namely Section 46(a) of the Wildlife (Amendment) Act 2000;
- BS 3998 (1989) Recommendations for tree work
- NRA (2006). Guidelines for the protection and preservation of trees, hedgerows and scrub prior to, during and post construction of national road schemes. National Roads Authority, Dublin.
- Section 46(a) of the Wildlife (Amendment) Act 2000
- Tree Preservation Orders (TPO), which are made under Section 205 of the Planning and Development Act, 2000

REFERENCE DOCUMENT

- Scottish Natural Heritage (2012). Protected Species Advice for Developers – Pine Marten. http://www.snh.gov.uk/docs/A1959323.pdf.
- Scottish Natural Heritage (2012). Protected Species Advice for Developers – Red Squirrel. http://www.snh.gov.uk/docs/A1959329.pdf.
- http://www.fisheriesireland.ie/Research/invasive-species.html
- http://www.nonnativespecies.org/checkcleandry/
- See Environmental Management Plan for UWF Grid Connection, Section 6: Environmental Emergency Procedure for Frac-Out during Drilling Works.
- EIA Report, Volume C4: EIAR Appendices, Appendix 11.4: UWF Grid Connection HDD Risk Assessment
- Code of Practice in relation to access to land and/or premises (ESB Networks - Document No: DOC-110602-ACP)
- Guidelines for the Treatment of Air Quality During the Planning and Construction of National Road Schemes (TII,2011)
- Guidance on the Assessment of Dust from Demolition and Construction (IAQM, 2014)

The Project Design Measures, Best Practice Measures, Management Plans and Emercency Response Measures are included in full in the appended UWF Grid Connection Environmental Management Plan (Appendix A9), UWF Related Works Environmental Management Plan (Appendix A10) and the Management Plans for Upperchurch Windfarm (Construction Environmental Management Plan, Ecological Management Plan and Early Operational Phase Environmental Management Plan) included in Appendix A16. The planning conditions for the consented Upperchurch Windfarm will also be included in the relevant Upperchurch Windfarm Environmental Management Plans.

5.3.9.3 Efficacy in respect of the use of Concealed Access Roads by Hen Harrier

The Concealed Access Roads, proposed as part of the UWF Grid Connection design, will provide habitat at source for hen harrier. The design and planting methodology for the Concealed Access Roads has been developed by hen harrier experts (Inis Environmental) and peatland ecology expert (Dr.Mary O'Connor) (in conjunction with the developer and their engineering team) in accordance with the following best practice and best scientific knowledge:

- Anderson, P., J. Walker & M. Buckler (2008) Moorland restoration – potential and progress. In: Bonn, A., T. Allott, K. Hubacek & J.
- Buckler, M., J. Walker & A. Bonn (2008) Bare Peat Restoration on Peak District Moorlands: Nurse Crop Establishment and Plant Succession. Moors for the Future Report No. 14, Edale.
- Walker, J., J. Holden, M. G., Evans, F. Worrall, S. Davison & A. Bonn (2008) A compendium of UK peat restoration and management projects. Final report to Defra, project code SP0556
- Scottish Natural Heritage Information and Advisory Note Number 44 *Heather re-establishment on mechanically-disturbed area,*
- Personal communication has also been undertaken with Dr. Mark McCorry, Bord na Mona on the successful heather re-establishment projects in Ireland.

The potential for Hen Harrier exclusion from habitat along new permanent access roads, permanent berms and permanent clearfell areas is negated by the provision of Concealed Access Roads into which heathers and upland grasses will be planted into the rigid geocells which will form the top layer of the Concealed Access Roads. These Concealed Access Roads will be used, for all new permanent roads within the SPA, to provide vehicular access to Joint Bay locations instead of standard stone roads. Native upland grasses will be used on Concealed Access Roads within rough grassland areas, while a 75:25 mix of mature native (Irish or Scottish) heather with grass nurses will be used at Concealed Access roads within forestry areas; this includes the

clearfelled area at Castlewaller/Killeen. Roadside berms and road margins, and any clearfelled areas will also be planted with mature heathers and grass nurse species. These Concealed Access Roads will provide habitat for harriers and will avoid the loss of constituent parts of the Slevefelim to Silvermine Mountains SPA.

The planting of the geocells with mature plantlets along with a suitable grass nurse will take place prior to construction; to avoid any time delay in the provision of habitat at source. In order to ensure that sufficient quantity of plants is available for the Concealed Access Roads, the developer has contracted a number of nurseries, and heather and grasses are being grown.

5.3.9.3.1 *Heather Growth*

As stated above, the planting treatments in respect of Concealed Access Roads have been developed by a hen harrier expert (Mr Howard Williams) in conjunction with Dr. Mary O'Connor, a recognised peatland ecologist and an expert in the provision of this method of habitat re-instatment. We refer to Dr. O'Connor's methodology for the planting of the Concealed Access Roads in Appendix A18: *Vegetation Reinstatement Methodology along Concealed Access Roads for UWF Grid Connection*.

In order to ensure that the heather *(Calluna vulgaris*) grows successfully, it will be planted with a grass 'nurse' species such as Agrostis Capillaris. The nurse grasses will provide shelter and protection to the heather plants from wind and soil erosion. These grass nurse plants will be planted at a ratio of approximately 1 grass plant per 3 heather plants. The planting of heather into a grass nurse species has been successfully carried out on reinstatement sites in Ireland (See Appendix A16).

The design of the Concealed Access Roads will provide at least 150mm of root growth space for the heather plants. This depth of peat will provide enough rootspace to allow the heather to grow successfully. Along the sections of Concealed Access Roads which will be planted with heather plants, the geocells will have a minimum depth of 150mm. In addition, a 20mm layer of peat will be provided under the geocells, while a rockfill layer placed underneath will provide extra peat/root space while providing drainage for the Concealed Access Roads to prevent waterlogging.

Inis hen harrier ecologists in conjunction with Dr. Mary O'Connor (peatland ecologist) were involved in the planting of an 8m section of Concealed Road on top of a standard stone road, which was used to confirm the construction methodology, planting densities and use of materials. Illustrative plates are provided on the following pages.

5.3.9.3.2 *Use by Hen Harriers*

The published literature is clear in stating the positive selection of heather and grassland (non-improved) by foraging Hen Harrier. The foraging habitat preferences of Hen Harriers in Ireland are generally biased towards moorland, grassland mosaics and prethicket forest habitats (see O'Donoghue, 2004; 2010; Barton et al., 2006; Irwin et al., 2012, as cited in NPWS, 2015[18]) which support larger numbers of Hen Harrier preferred prey species, such as Meadow Pipit (*Anthus pratensis*) and Skylark (*Alauda arvensis*).

[18] NPWS.2015. Hen Harrier Conservation and the Forestry Sector in Ireland.

In a study published in 2009 in the journal *Biological Conservation* in respect of hunting habitat selection by Hen Harriers on moorland (including within SPA's) (Arroyo *et al.* 2009[19]); the results support a clear preference by Hen Harriers for Heather/Grass mosaics. This study goes further and states that on the whole the results indicate that the creation or maintenance of a heather/rough grass mixture, (along with the avoidance of grassland improvement) would be a beneficial conservation strategy for Hen Harriers in most moorland areas.

Harriers have also been recorded foraging over heather in the Irish context; illustrative plates showing same are provided overleaf, from Inis 2014[20]. One of the nest locations identified in the current study to inform EIA reporting, and within 500m of the Grid Connection Route, was located in heather (in 2017) and birds actively foraged in the vicinity.

Plate 1: *Planted Geocell Roadway with Heather (Calluna vulgaris).*

[19] https://doi.org/10.1016/j.biocon.2008.11.013

[20] Inis Environmental Consultants Ltd. (2014) Buttevant Wind Farm: Hen Harrier (*Circus cyaneus)* Compensatory Habitat Management Plan.

REFERENCE DOCUMENT

***Plate 2**: Planted geocell Roadway with Heather (Calluna vulgaris), as seen from above.*

Plates 3 and 4: Hen Harrier foraging over heather *Calluna vulgaris* between trees and rides in County Tipperary (© Inis Ecology, 2018).

REFERENCE DOCUMENT

5.3.9.4 Compliance Monitoring

The implementation of the environemental protection measures (Project Design Environmental Protection Measures, the Additional Mitigation Measure AMM-01, the Best Practice Measures, and the Waste, Traffic, Invasive Species and Surface Water Quality Management Plans) will be managed through dedicated environmental management plans for the UWF Grid Connection, UWF Related Works and the consented Upperchurch Windfarm.

The implementation of these protection measures will be the responsibility of the Project Manager and a contractual obligation on the Contractor/Construction Site Manager during the construction stage. The Project Promoter will have overall responsibility that the Whole UWF Project Elements are developed as planned.

Monitoring and auditing of the compliance of the construction of UWF Grid Connection, UWF Related Works and Upperchurch Widnfarm with their respective Environmetnal Management Plans will be carried out by an independent (of the Construction Contractor), full time, and competent Environmental Clerk of Works, and by the Upperchurch Windfarm Site Manager during the early operational stage. The Environmental Clerk of Works will also prepare weekly EMP Compliance Reports.

The Project Promoter will be responsible for the costs of monitoring and will provide sufficient resources to the Environmental Clerk of Works to monitor, audit and report on the compliance of construction works with the EMP. Sufficient resources will also be provided to the Environmental Clerk of works to engage a team of Environmental Managers to assist with monitoring and auditing, and for specialist environmental and engineering consultants as required.

5.3.9.4.1 *Compliance Monitoring in relation to the Slievefelim to Silvermines Mountains SPA*

An onsite monitoring protocol will be undertaken for the Concealed Access Roads in terms of growth establishment for the first 18 months to ensure that the growth is sufficient to effectively provide hen harrier habitat. This monitoring schedule will be completed by a hen harrier expert and peatland ecologist with proven extensive expert experience of developing and managing hen harrier foraging habitats within SPAs- within the oversight role included in PD63 (“Within the SPA, this reinstatement will be overseen by a competent peatland ecologist and a hen harrier expert”). Best practice in respect of the monitoring of nesting and roosting Hen Harrier (GC-BPM-12: Appendix A9 EMP for UWF Grid Connection, Volume D EMP – TAB 7) ensures that surveys (both breeding and roosting) will be completed prior to the start-up of all construction activities, until construction is complete and for 4 years thereafter (Years 1-3 and Year 5) (Project Design Measure). Surveys will also be undertaken in years coinciding with any National Surveys of Hen Harrier to fully inform future trends in respect of the Slievefelim to Silvermines Mountains SPA. A report including nesting activity, levels of usage and any disturbance events, will be provided to the Competent Authority and NPWS following the completion of each survey season.

The Project Ecologist will keep NPWS informed of the real-time status of nesting Hen Harrier as a result of the monitoring associated with this project.

REFERENCE DOCUMENT

5.3.9.4.2 *Compliance Monitoring in relation to the Lower River Shannon SAC and Lower River Suir SAC*

In line with the guidance documents prescribed above, during any dewatering operations carried out at watercourse crossings, it is possible that juvenile Atlantic salmon and lamprey species, as well as White-clawed crayfish may be present after the watercourse has being dammed. To avoid any direct impacts, a qualified and experienced aquatic ecologist will be present during the initial dewatering works to manage and confirm the removal of these species, under license, to alternative suitable habitat, well away from the working area. This will avoid indirect effects on contiguous populations of these Annex II species within the Lower River Shannon SAC or Lower River Suir SAC downstream. As prescribed in the Best Practice Measures, flows within affected watercourses will maintain downstream connectivity at all times to avoid a dewatering event in the watercourse channel.

The measures required above for watercourse crossings will ensure that water quality impacts from instream sediment, or site runoff mobilised during construction are adequately mitigated. There will be no direct discharge of pumped water into any watercourse.

All watercourse crossings occur within or upstream of salmonid watercourses. In order to demonstrate compliance with and effectivess of the prescribed mitigation, it is proposed to carry out construction phase monitoring of water quality upstream and downstream of the crossing locations. Both suspended solids (TSS) and turbidity will be monitored upstream and downstream of at each watercourse crossing during works. Suspended solids analysis will be carried out in an approved laboratory and data cannot be obtained in real-time. Turbidity probes provide real-time data on site and can be used to indicate a comparison of the suspended silt fraction in the water column upstream and downstream. Both TSS and turbidity sampling will be completed in-situ both upstream and downstream of all watercourse crossings (other than drains) immediately before works commence and then during and after to manage compliance with water quality standards. It is recognised that TSS and turbidity fluctuate naturally within the aquatic environment based on seasonal and sporadic flow events. The measures proposed below are based on standard guidance; however, ongoing monitoring during the works will provide proactive adjustments in line with prevailing conditions.

Surface water quality standards for TSS are not specified in the Surface Water Regulations (2009); however, limit levels or trigger values will be defined for both TSS and turbidity based on the pre-construction monitoring results; which will also be compared to maximum guideline values for sensitive receptors as follows:

- With reference to the minor headwater streams within the Clodiagh and Multeen Freshwater pearl mussel catchments, it is proposed that no elevated silt load is discharged to these watercourses downstream of the works areas.

We also refer BPM's in respect of the protection of Water Quality during Construction – see Appendix A9/A10.

5.3.9.5 Summary Statement on the Efficacy of the Environmental Protection Measures

REFERENCE DOCUMENT

The above environmental protection measures measures have been developed and will be implemented in the light of best scientific knowledge and best practice or 'tried and tested' methods, therefore no reasonable scientific doubt remains as to the absence of any adverse effects on the integrity of the European Sites under consideration.

The implementation of the above environmental protection measures (Project Design Measures, Best Practice Measures, Management Plans, methodology for the Concealed Access Roads) will be a contractual obligation on the Appointed Contractors, and the compliance with these measures will be the audited by a team of competent, independant Environmental Managers who will have a full-time presence at works areas during the construction period.

REFERENCE DOCUMENT

5.3.10 Addressing Mitigation Failure

The Project Design Measures and Best Practice Measures prepared specifically for this project have been designed to incorporate regulatory guidance and are based on robust and proven measures for the avoidance of significant adverse effects. In addition, the proposed Management Plans include a supervisory structure which ensures accountability for all works elements, with requirements for suitably qualified specialists (Proponent oversight; Proponent's representatives including Ecological Clerk of Works/Site Ecologist; Contractor's specialist input; competent experts as supervision at horizontal directional drilling and Concealed Access Road works etc.) in order to manage sensitive works elements and deliver the planned outcomes within the parameters of the impact assessment, as specified. On this basis, it can be confidently concluded that failures in the mitigation measures and their prescribed outcomes will be avoided.

REFERENCE DOCUMENT

5.4 Conclusion

In summary it can be concluded that in light of the conservation objectives and rationale for designation of the European Sites under consideration; the potential for significant effects exists as a result of the Whole Upperchurch Windfarm Project. These potentially significant effects have been evaluated, and with the implementation of Additional Mitigation Measures AMM-01 in respect of Otter, it is concluded that neither the UWF Grid Connection, nor the Whole Upperchurch Windfarm Project, nor any other Element of the Whole UWF Project, alone or in combination, will result in any effects that will adversely affect the integrity of the European Sites under consideration, having regard to their respective conservation objectives, in circumstances where "no reasonable scientific doubt" remains as to the absence of such adverse effects.

REFERENCE DOCUMENT

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Whole Upperchurch Windfarm Project

Natura Impact Statement
for
Whole UWF Project Elements 1 to 5

March 2018

Appendix A1: European Site Synopsis

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ECOPOWER

Whole Upperchurch Windfarm Project

Natura Impact Statement for Project Elements 1-5

Appendix A1 European Site Synopsis

March 2018

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Site Name: Anglesey Road SAC

Site Code: 002125

Anglesey Road is a steep-sided valley which extends approximately 1.8 km along the Multeen River to the north of Hollyford village, Co. Tipperary. Most of the site lies between 210 and 270 m above sea level.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[6230] Species-rich *Nardus* Grassland*

The unimproved, species-rich upland grassland at this site is mainly dominated by grasses such as bents (*Agrostis* spp.), Crested Dog's-tail (*Cynosurus cristatus*), Sheep's-fescue (*Festuca ovina*) and Wavy Hair-grass (*Deschampsia flexuosa*). Herbs present include Heath Bedstraw (*Galium saxatile*), Tormentil (*Potentilla erecta*), violets (*Viola* spp.) and speedwells (*Veronica* spp.). Localised patches of heathy grassland contain Heather (*Calluna vulgaris*) and Bilberry (*Vaccinium myrtillus*). Bracken (*Pteridium aquilinum*) cover is extensive and there are scattered shrubs of Hawthorn (*Crataegus monogyna*).

On the steep valley sides and in stream gullies scrub comprised of willow (*Salix* spp.), Downy Birch (*Betula pubescens*), Rowan (*Sorbus aucuparia*), Hazel (*Corylus avellana*), Hawthorn and Ash (*Fraxinus excelsior*) has developed.

Agricultural improvement and afforestation are the main threats to the site.

Anglesey Road is a comparatively small site which contains a range of habitat types and species. It is of particular importance for the good quality examples of species-rich, unimproved, upland grassland found. This habitat is becoming increasingly rare in Ireland and Europe, and is listed on Annex I of the E.U. Habitats Directive with priority status.

Site Name: Askeaton Fen Complex SAC

Site Code: 002279

Askeaton Fen Complex consists of a number of small fen areas to the east and south-east of Askeaton in Co. Limerick. This area has a number of undulating hills, some of which are quite steep, and is underlain by Lower Carboniferous Limestone. At the base of the hills a series of fens/reedbeds/loughs can be found, often in association with marl or peat deposits. At the south-east of Askeaton, both Cappagh and Ballymorisheen fens are surrounded by large cliff-like rocky limestone outcrops.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[7210] *Cladium* Fens*
[7230] Alkaline Fens

In Askeaton Fen Complex SAC a diversity of fen types are represented in a gradation from open water to drier seepage areas. One of the more important fen types, *Cladium* fen, which contains Great Fen-sedge (*Cladium mariscus*), occurs in various forms and is the most common fen type within the SAC. It is associated with wet conditions generally not >25 cm deep and can be found in mono-dominant stands growing on a marl base, such as at Feereagh and Mornane Loughs, and in the fen in the townland of Mornane. It can also be co-dominant with Common Reed (*Phragmites australis*) in slightly drier conditions, such as in Deegerty, Blind Lough and Dromlohan. It is also found in association with alkaline fen species such as Black Bog-rush (*Schoenus nigricans*) where it grows on a peaty substrate. *Cladium* fen is indicative of extremely base rich conditions. Typical species seen growing with the Great Fen-sedge include pondweeds (*Potamogeton* spp.), Marsh Horsetail (*Equisetum palustre*), Water Horsetail (*E. fluviatile*), Lesser Water-parsnip (*Berula erecta*), Lesser Marshwort (*Apium innundatum*), Bottle Sedge (*Carex rostrata*), particularly where marl is present, and Water Mint (*Mentha aquatica*). One such area of fen within the site is the only known location in Ireland for the water beetle *Hygrotus decoratus* and is also known to contain *Hydroporus scalesianus*, a rare water beetle indicative of undisturbed fens. At the edge of some of the Great Fen-sedge fens, particularly where improved grassland is not present, there is typically found a gradation to wet marsh, which in turn grades into wet grassland. These transition habitats add to the ecological diversity of the site.

Alkaline fen is characterised by the presence of Black Bog-rush in association with brown mosses and a small sedge community. The soil is permanently waterlogged but generally not flooded unless for a short period. Examples of this fen type are

found at the edge of almost all the sites, but its extent is much less than the Great Fen-sedge fen type within the SAC. The fen in the townlands of Moig West and Graigues is a good example of alkaline fen. Species seen growing with Black Bog-rush include Purple Moor-grass (*Molinia caerulea*), Long-stalked Yellow-sedge (*Carex lepidocarpa*), Carnation Sedge (*C. panicea*), rushes (*Juncus* spp.) and an abundance of brown mosses, including *Campylium stellatum, Ctenidium molluscum, Calliergon cuspidatum* and *Bryum pseudotriquetrum.* This fen type also grades into marsh and wet grassland.

Scrub and woodland is present on high ground in some areas, such as Ballymorisheen, Blind Lough, Ballyvogue, Dromlohan and Lough Feereagh. Species include Hawthorn (*Crataegus monogyna*), Blackthorn (*Prunus spinosa*), Gorse (*Ulex europaeus*), Ash (*Fraxinus excelsior*), willow (*Salix* sp.), Downy Birch (*Betula pubescens*) and Hazel (*Corylus avellana*). This is a useful faunal habitat particularly as it is adjacent to reedbeds and fens.

A small area of limestone species-rich grassland is found to the north of Balinvirick fen. Species found which are typically associated with the habitat include the Early-purple Orchid (*Orchis mascula*), Carline Thistle (*Carlina vulgaris*) and Mountain Everlasting (*Antennaria dioica*).

Snipe use the tall marsh vegetation at the edge of the fens. Birds of prey such as Sparrowhawk feed over the reedbeds and scrubland areas of the site.

Land use in the area is quite intensive, with improved grassland extending down relatively steep slopes to the edge of the fens/loughs. New drainage or the deepening of existing drains poses a threat to the aquatic habitats at the site. In some instances, the fens appear to be drying out.

This site is of conservation value because it supports two fen types, each of which exhibit many sub-types. *Cladium* fen is listed as an Annex I priority habitat under the E.U. Habitats Directive. These wetland habitats of fen, reedbeds, open water, marsh and wet grassland are also valuable in that they supply a refuge for fauna in an otherwise intensively managed countryside.

Site Name: Barrigone SAC

Site Code: 000432

Barrigone is situated approximately 5 km west of Askeaton, Co. Limerick. The site comprises an area of dry, species-rich, calcareous grassland and patches of scrub on a gentle, north-east-facing slope. The underlying limestone outcrops occasionally, and the proximity of the site to the Shannon Estuary adds a maritime influence.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[5130] Juniper Scrub
[6210] Orchid-rich Calcareous Grassland*
[8240] Limestone Pavement*
[1065] Marsh Fritillary (*Euphydryas aurinia*)

The open calcareous grassland supports an impressive range of plant species. Cowslip (*Primula veris*), Mountain Everlasting (*Antennaria dioica*), Carline Thistle (*Carlina vulgaris*), Wild Thyme (*Thymus praecox*), Wood Sage (*Teucrium scorodonia*) and Violets (*Viola* spp.) are present, while Burnet Rose (*Rosa pimpinellifolia*) is abundant and scattered throughout the grassland. The maritime influence is evident through the presence in the sward of Sea Plantain (*Plantago maritima*). The orchid flora is particularly well-developed and diverse, with eight species recorded on recent visits. These include Fragrant Orchid (*Gymnadenia conopsea*), Frog Orchid (*Coeloglossum viride*), Butterfly Orchid (*Platanthera bifolia*), Pyramidal Orchid (*Anacamptis pyramidalis*) and the scarce Irish Orchid (*Neotinea maculata*).

A range of scrub types are present, including a dense stand of Hazel (*Corylus avellana*) towards the south, and a small area dominated by Juniper (*Juniperus communis*) in the north. Blackthorn (*Prunus spinosa*), Hawthorn (*Crataegus monogyna*) and Gorse (*Ulex europaeus*) also form scrub patches, and these tend to be less species-rich.

Hairy Violet (*Viola hirta*), a species protected under the Flora (Protection) Order, 1999, occurs at Barrigone. The site also holds a large population of the Marsh Fritillary butterfly (*Euphydryas aurinia*), a species listed under Annex II of the E.U. Habitats Directive.

The primary threat to this site is quarrying. Grazing is also an important factor; over-grazing would cause damage to the vegetation, while under-grazing would allow scrub encroachment at the expense of grassland species which require more open

conditions. A balance between scrub and grassland is also important for invertebrate species.

A number of factors, including substrate, bedrock, microclimate and maritime influence, contribute to the floristic richness at Barrigone and hence to the ecological interest of this site. The presence of rare species of plant and invertebrate highlight the site's conservation value.

Site Name: Bolingbrook Hill SAC

Site Code: 002124

Situated approximately 6 km south-east of Silvermines village in Co. Tipperary, this upland site comprises Bolingbrook Hill and the nearby eastern slopes of Silvermine Mountains in Curryquin and Mucklin townlands. Most of the land is above 270 m and the highest point is at 404 m.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[4010] Wet Heath
[4030] Dry Heath
[6230] Species-rich *Nardus* Grassland*

Unimproved, species-rich upland grassland covers the lower slopes of Bolingbrook Hill and much of Curryquin. The dominant grasses found are Mat-grass (*Nardus stricta*), bent grasses (*Agrostis* spp.) and Crested Dog's-tail (*Cynosurus cristatus*). Moss and Bracken (*Pteridium aquilinum*) cover is extensive. The herb component is diverse and many fields have gorse (*Ulex* sp.) scrub or scattered Hawthorn (*Crataegus monogyna*) shrubs. Other species present include Heath Bedstraw (*Galium saxatile*), Sheep's-fescue (*Festuca ovina*), Devil's-bit Scabious (*Succisa pratensis*), Tormentil (*Potentilla erecta*), Lousewort (*Pedicularis sylvatica*) and Mat-grass.

A small area of blanket bog occurs on the western side of Bolingbrook Hill. Its margins are damaged by former peat-cutting activities. Some blanket bog also occurs in Mucklin. Wet heath is the main habitat in the western part of this site, usually occurring in close association with acidic grassland. Heath species present include Heather (*Calluna vulgaris*), Cross-leaved Heath (*Erica tetralix*), Bog-myrtle (*Vaccinium myrtillus*), Heath Rush (*Juncus squarrosus*), Deergrass (*Scirpus cespitosus*), Purple Moor-grass (*Molinia caerulea*), Green-ribbed Sedge (*Carex binervis*) and Tormentil. In the wetter areas, Bog Asphodel (*Narthecium ossifragum*) and Greater Sundew (*Drosera rotundifolia*) occur. Mosses are a feature, especially bog mosses (*Sphagnum* spp.). On some of the steeper slopes where the peaty soils are thin, good quality dry heath occurs. Typical species here include Heather, Mat-grass, Common Bent (*Agrostis capillaris*), Tormentil, Bell heather (*Erica cinerea*) and Western Gorse (*Ulex gallii*), and moss cover is extensive in places. Scrub comprised of willow (*Salix* spp.), Hawthorn, Rowan (*Sorbus aucuparia*), Ash (*Fraxinus excelsior*) and Blackthorn (*Prunus spinosa*) has also developed on parts of the steep slopes.

A good diversity of animal species associated with peatland habitats occurs, including Irish Hare, Red Grouse, Common Frog and Viviparous Lizard.

Agricultural improvement and afforestation are the main threats to the site. Much of the surrounding land is extensively planted with conifers.

Bolingbrook Hill is a comparatively small site which contains a range of habitats, and species, including three habitat types listed on the E.U. Habitats Directive. It is of particular importance for the good quality examples of species-rich, unimproved upland grassland found. This habitat is becoming increasingly rare in Ireland and Europe and is listed with priority status in the Directive. The presence of good quality wet and dry heath, which are also listed on this Annex, contributes to the overall importance of the site.

REFERENCE DOCUMENT

Site Name: Clare Glen SAC

Site Code: 000930

Clare Glen lies on the Limerick - Tipperary border, in the western foothills of the Slievefelim Mountains, about 10 km north-west of Cappamore. The glen was formed by the action of the Clare River cutting into the Old Red Sandstone. The site comprises the wooded river valley about 2 km above the Clare Bridge.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[91A0] Old Oak Woodlands
[1421] Killarney Fern (*Trichomanes speciosum*)

The woodland is of mixed composition, but most of the broadleaved species are native, including oak (*Quercus* sp.), Ash (*Fraxinus excelsior*), Rowan (*Sorbus aucuparia*) and willows (*Salix* spp.). The non-native species include Beech (*Fagus sylvatica*) and several conifer species. In the shrub layer native species include Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*) and Holly (*Ilex aquifolium*), but also the non-native Rhododendron (*Rhododendron ponticum*) and Cherry Laurel (*Prunus laurocerasus*). The ground vegetation includes species such as Hard Fern (*Blechnum spicant*), Wood-sorrel (*Oxalis acetosella*) and Ivy (*Hedera helix*).

A rich bryophyte flora is associated with the river and the wet rocks around it, including the rare mosses *Amblystegium fluviatile*, *Fissidens exiguus* and *Pohlia campotrachela*, and the liverworts *Lejeunea holtii*, *Colura calyptrifolia* and *Dumortiera hirsuta*. The site is also notable for the presence of several rare species of Myxomycete fungus, namely *Fuligo muscorum*, *Stemonitopsis hyperopta* and *Licea testudinacea*, the last-named in one of only two known Irish sites.

The site is of further importance for the presence of the rare and legally protected (Flora (Protection) Order, 1999) Killarney Fern (*Trichomanes speciosum*).

The woodland, although planted with many exotic trees, is mature and conforms to a type listed on Annex II of the E.U. Habitats Directive. The site is scenic and popular as an amenity area, and the presence of a number of rare and scarce species adds further to its importance.

Site Name: Curraghchase Woods SAC

Site Code: 000174

This site is situated approximately 7 km east of Askeaton in Co. Limerick. The area is characterised by glacial drift deposits over Carboniferous limestone. The site consists largely of mixed woodland and a series of wetlands.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[91E0] Alluvial Forests*
[91J0] Yew Woodlands*
[1303] Lesser Horseshoe Bat (*Rhinolophus hipposideros*)

One of the main interests at the site is the presence of a hibernation site of the Lesser Horseshoe Bat. The bats hibernate in the cellars of the former mansion Curraghchase House. The entrance to the cellar is now grilled and all other access points blocked to prevent disturbance. In recent years bats have remained within the cellar throughout the year.

In winter 1995/96 more than 60 bats were recorded in the hibernation site, rating the site of international importance. It is considered that the number of bats will increase now that the site is protected from disturbance. This is the largest known site for this species in Co. Limerick.

The woodland consists of both deciduous species and stands of commercial conifers. Beech (*Fagus sylvatica*) is the most frequent deciduous species, but Pedunculate Oak (*Quercus robur*), Ash (*Fraxinus excelsior*), Sycamore (*Acer pseudoplatanus*) and Hornbeam (*Carpinus betulus*) are also present. Spruce (*Picea* sp.) and Scots Pine (*Pinus sylvestris*) are the commonest conifers. Hazel (*Corylus avellana*) scrub and areas of wet woodland (*Salix* spp.) also occur.

The alluvial forest occurs in the southern part of the site and occupies low ground in a stream valley and some areas adjacent to a small lake. The dominant canopy species include Rusty Willow (*Salix cinerea* subsp. *oleifolia*), Alder (*Alnus glutinosa*), Downy Birch (*Betula pubescens*) and Ash. Exotics also occur, both conifer and broadleaved species, such as Beech and Horse-chestnut (*Aesculus hippocastanum*). A rich herb layer is found where the conifers are less dense, characterised by such species as Bugle (*Ajuga reptans*), Hemlock Water-dropwort (*Oenanthe crocata*), Yellow Iris (*Iris pseudacorus*), Meadowsweet (*Filipendula ulmaria*), Water-cress (*Nasturtium officinale*), Common Nettle (*Urtica dioica*) and Wood Sanicle (*Sanicula europaea*).

The Yew wood occurs as a stand on a limestone ridge above a stream valley. It is associated with an Oak-Ash wood, but also has a range of commercial planted species. Nevertheless, Yew is well represented and is readily regenerating. Other species present include Holly (*Ilex aquifolium*), Ash, Pedunculate Oak, Hazel and Hawthorn (*Crataegus monogyna*).

A series of small lakes and fens runs the length of the site. Some of these lakes are overgrown with vegetation. Black Bog-rush (*Schoenus nigricans*), Great Fen-sedge (*Cladium mariscus*), Greater Tussock-sedge (*Carex paniculata*), Carnation Sedge (*Carex panicea*) and Blunt-flowered Rush (*Juncus subnodulosus*) are some of the wetland species recorded. These wetlands, along with some wet grassland, add habitat diversity to the site.

The semi-natural habitats within the site provide ideal foraging habitat for the Lesser Horseshoe Bat. Further planting of conifer tree species at the expense of deciduous species should be avoided and attempts should be made to increase the area of deciduous woodland.

The combination of a secure hibernation site and suitable foraging habitat and the presence of over 60 individuals make Curraghchase Woods an internationally important site for the Lesser Horseshoe Bat. The presence of two woodland types that are listed with priority status on Annex I of the E.U. Habitats Directive, and especially Yew woodland, which is of very limited occurrence in Ireland, is of particular note.

REFERENCE DOCUMENT

Site Name: Glenomra Wood SAC

Site Code: 001013

Glenomra Wood is a deciduous woodland located in south-east Co. Clare, about 10 km north of Limerick city.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[91A0] Old Oak Woodlands

The dominant tree in Glenomra Wood is Downy Birch (*Betula pubescens*), which attains a height of about 20 m in places. This is mixed with Sessile Oak (*Quercus petraea*), Ash (*Fraxinus excelsior*) and Beech (*Fagus sylvatica*) throughout. Holly (*Ilex aquifolium*) is abundant and is the main understorey species. Hazel (*Corylus avellana*), regenerating Birch, Gorse (*Ulex europaeus*) and Bramble (*Rubus fruticosus* agg.) are other understorey species. Willow (*Salix* spp.) occurs in the wetter areas.

In shaded areas the ground flora is poorly developed, but in more open areas species such as Bluebell (*Hyacinthoides non-scripta*), Wood Anemone (*Anemone nemorosa*), Great Wood-rush (*Luzula sylvatica*), Ivy (*Hedera helix*) and Wood-sorrel (*Oxalis acetosella*) occur.

Further habitat diversity is created by the presence of streams within the woodland, and also by the presence of a small area with raised bog vegetation. Here bog mosses (*Sphagnum* spp.) and Heather (*Calluna vulgaris*), amongst other species, are found.

Three Red Data Book mammals occur in the site: Badger, Pine Marten and Hare. A large population of Common Frog breeds in the south-west of the site. This amphibian is also listed in the Red Data Book. Pheasant, Woodcock and Snipe are also present in the site.

The site is grazed by cattle, especially the northern sector. Parts of the wood clear-felled in recent years are showing fairly rapid natural regeneration.

Glenomra Wood is a good example of a deciduous semi-natural woodland and is of considerable conservation significance as it is of a type listed on Annex I of the E.U. Habitats Directive.

Site Name: Glenstal Wood SAC

Site Code: 001432

Glenstal Wood, which is associated with Glenstal Abbey, lies in the western foothills of the Slievefelim Mountains, about 8 km north-west of Cappamore, Co. Limerick. The glen has been cut into Old Red Sandstone and runs in a north-easterly direction for about 2 km, eventually becoming a steep-sided rocky ravine.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1421] Killarney Fern (*Trichomanes speciosum*)

At Glenstal Wood, oak (*Quercus* sp.) woodland remnants occur which support a rich fern, bryophyte and lichen flora. The rare lichen, *Enterographa elabora*, a species known from only three other counties in Ireland, has been recorded at the site. Some oak woodland remnants are also found about Glenstal Abbey.

The site is of conservation importance for the presence of Killarney Fern (*Trichomanes speciosum*), a rare species that is listed on Annex II of the E.U. Habitats Directive and that is also protected under the Flora (Protection) Order, 1999.

Site Name: Kilduff, Devilsbit Mountain SAC

Site Code: 000934

This upland site is situated approximately 6 km north-west of Templemore in Co. Tipperary. It comprises the summit of Devilsbit Mountain and much of the eastern side of the ridge which extends northwards to Kilduff Mountain. Most of the site lies above 250 m and the highest point is 480 m. Devilsbit Mountain is composed of Silurian grits.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[4030] Dry Heath
[6230] Species-rich *Nardus* Grassland*

The main habitats found within the site are upland grassland, heath and woodland. Heath dominates the upper slopes and the summit of Devilsbit Mountain, and the site contains small areas of good quality dry heath.

Upland acid grassland covers extensive areas, and is relatively herb-rich. There is a diversity of vegetation communities found, as well as plant species. Populations of the rare Small-white Orchid (*Pseudorchis albida*), a species which is protected under the Flora (Protection) Order, 1999, occur in such areas of unimproved grassland. Associated species include Sheep's-fescue (*Festuca ovina*), Great Wood-rush (*Luzula sylvatica*), Devil's-bit Scabious (*Succisa pratensis*) and Bracken (*Pteridium aquilinum*).

The central wooded area is a relic of former planting. Small groves of mature Beech (*Fagus sylvatica*) and oak (*Quercus* sp.) trees persist on the higher slopes. Naturally-regenerating Alder (*Alnus glutinosa*) woodland with willow (*Salix* spp.) dominates a wet area traversed by streams near the eastern boundary of the site. Elsewhere on the site, woodland is mixed and comprises Beech, Alder, Ash (*Fraxinus excelsior*), Hazel (*Corylus avellana*) and Hawthorn (*Crataegus monogyna*).

Peregrine, a species listed on Annex I of the E.U. Birds Directive, breeds within the site.

The site is heavily grazed by cattle and sheep. Agricultural improvement and afforestation are the main threats, particularly to those areas of unimproved grassland found within the site.

The site is of conservation importance due to the presence of two habitats listed in Annex I of the E.U. Habitats Directive, dry heath and species-rich *Nardus* grassland, the latter being of priority status. The presence of the rare and protected Small-white Orchid adds significantly to the value of the site.

Site Name: Keeper Hill SAC

Site Code: 001197

Keeper Hill, or Slievekimalta, is situated between the Silvermines and Slieve Felim Mountains, 13 km south of Nenagh in Co. Tipperaray. Reaching an altitude of 695 m, this rounded, rather steep peak of Old Red Sandstone is notably higher than any of the surrounding upland areas. The site includes the summit and slopes above 250 m which have not yet been afforested.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[4010] Wet Heath
[7130] Blanket Bogs (Active)*

Mountain blanket bog at this site is dominated by cottongrasses (*Eriophorum* spp.), Deergrass (*Scirpus cespitosus*), Purple Moor-grass (*Molinia caerulea*) and Heather (*Calluna vulgaris*). The moss layer is well developed with a deep bog moss (*Sphagnum* spp.) cover. The relatively uncommon *Sphagnum russowii* has been reported from this habitat. Other species recorded include Crowberry (*Empetrum nigrum*), Bog Asphodel (*Narthecium ossifragum*) and the moss *Racomitrium lanuginosum.*

Heath occurs where the depth of peat is shallow. This is found at the summit, where peat has eroded, on the steep slopes and also in mosaic with blanket bog. The heath is predominantly wet heath, with Heather, Cross-leaved Heath (*Erica tetralix*), Purple Moor-grass, Bilberry (*Vaccinium myrtillus*) and Heath Rush (*Juncus squarrosus*) being the most common species. Bog mosses are also well represented. On the higher areas, Cowberry (*Vaccinium vitis-idaea*) and Crowberry, species indicative of alpine heath, occur. On the lower slopes the heath forms a mosaic with wet grassland and here patches of Gorse (*Ulex europaeus*) scrub occur.

Upland grassland occurs on mineral soils on the lower slopes and is especially well-developed on the southern and northern slopes. The dominant species are Sheep's-fescue (*Festuca ovina*), Mat-grass (*Nardus stricta*), Common Bent (*Agrostis capillaris*), Tormentil (*Potentilla erecta*) and Heath Bedstraw (*Galium saxatile*). In wetter areas, rush species such as *Juncus effusus* and *J. articulatus* become dominant.

Peregrine Falcon, a species listed in Annex I of the E.U. Birds Directive, breeds within the site. Red Grouse occur amongst the tall heather east of the summit.

Land use within the site consists of some peat cutting to the north-west of the summit and some track development. Grazing is minimal and confined to the lower grassy slopes to the north of the site. The site is almost entirely surrounded by coniferous forest plantations and this remains the greatest threat.

This site is of considerable conservation value due to the presence of two habitats which are listed on Annex I of the E.U. Habitats Directive, one of which has priority status. The presence of important bird species adds to the importance of the site.

REFERENCE DOCUMENT

SITE SYNOPSIS

SITE NAME: LOUGH DERG (SHANNON) SPA

SITE CODE: 004058

Lough Derg lies within counties Tipperary, Galway and Clare and is the largest of the River Shannon Lakes, being some 40 km long. Its maximum breadth across the Scarriff Bay -Youghal Bay transect is 13 km but for most of its length it is less than 5 km wide. The lake is relatively shallow at the northern end being mostly 6 m in depth but in the middle region it has an axial trench and descends to over 25 m in places. The narrow southern end of the lake has the greatest average depth, with a maximum of 34 m. The greater part of the lake lies on Carboniferous limestone but the narrow southern section is underlain by Silurian strata. Most of the lower part of the lake is enclosed by hills on both sides, the Slieve Aughty Mountains to the west and the Arra Mountains to the east. The northern end is bordered by relatively flat, agricultural country. The lake shows the high hardness levels and alkaline pH to be expected from its mainly limestone catchment basin, and it has most recently been classified as a mesotrophic system. The lake has many small islands, especially on its western and northern sides. The shoreline is often fringed with swamp vegetation. Aquatic vegetation includes a range of charophyte species, including the Red Data Book species, *Chara tomentosa*. The shoreline is often fringed by swamp vegetation, comprised of such species as Common Reed (*Phragmites australis*), Great Fen-sedge (*Cladium mariscus*) and Bottle Sedge (*Carex rostrata*).

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Cormorant, Tufted Duck, Goldeneye and Common Tern. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

Lough Derg is of importance for both breeding and wintering birds. The site supports a nationally important breeding colony of Common Tern (55 pairs recorded in 1995). Management of one of the islands used for nesting has increased the area of suitable habitat available and prevented nests being destroyed by fluctuating water levels. Large numbers of Black-headed Gull have traditionally bred on the many islands (2,176 pairs in 1985) but the recent status of this species is not known. The islands in the lake also support a nationally important Cormorant colony - 167 pairs were recorded in 1995; a partial survey of the lake in 2010 recorded 113 pairs. Lough Derg is also a noted breeding site for Great Crested Grebe (47 pairs in 1995) and Tufted Duck (169 pairs in May 1995).

In winter, the lake is important for a range of waterfowl species, including nationally important populations of Tufted Duck (776) and Goldeneye (157) – all figures are mean peaks for 4 of the 5 seasons between 1995/96 and 1999/2000. Other species which occur in winter include Mute Swan (164), Whooper Swan (18), Wigeon (249), Teal (301), Mallard (376), Little Grebe (14), Cormorant (90), Coot (173), Lapwing

(922), Curlew (66) and Black-headed Gull (732). Areas to north and south west of Lough Derg have been utilised in the past by small numbers of Greenland White-fronted Goose – 19 geese were recorded on callowland near Portumna in 1996/97. A relatively small flock based in the Lough Derg-Lough Graney area and possibly further afield have been recorded in the Scarriff Bay area – 20 geese recorded in 2004. Few sightings, at either location have been made in recent years.

Hen Harrier are also known to roost in the reedbeds on the margins of the site during the winter.

Lough Derg (Shannon) SPA is of high ornithological importance as it supports nationally important breeding populations of Cormorant and Common Tern. In winter, it has nationally important populations of Tufted Duck and Goldeneye, as well as a range of other species including Whooper Swan. The presence of Whooper Swan, Greenland White-fronted Goose, Hen Harrier and Common Tern is of particular note as these are listed on Annex I of the E.U. Birds Directive. Parts of Lough Derg (Shannon) SPA are a Wildfowl Sanctuary.

8.7.2014

REFERENCE DOCUMENT

Site Name: Lough Derg, North-east Shore SAC

Site Code: 002241

Lough Derg, the lowest order lake on the River Shannon, is one of the largest bodies of freshwater in Ireland. This SAC, however, only includes the northern shore of the lake from the mouth of the Cappagh River in the north-west to just below Black Lough at the north-eastern shore. The greater part of this site lies on Carboniferous limestone, although there is Old Red Sandstone on the southern shores of the eastern section.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[5130] Juniper Scrub
[7210] *Cladium* Fens*
[7230] Alkaline Fens
[8240] Limestone Pavement*
[91E0] Alluvial Forests*
[91J0] Yew Woodlands*

The geology of the lake shore is principally limestone and in places this protrudes at the surface in the form of boulders and rubble, and can be classified as limestone pavement. These are often bryophyte-rich surfaces or else support a calcareous grassland or heath flora, as well as some woody species, such as Yew (*Taxus baccata*) and Juniper (*Juniperus communis*). Examples occur at Cornalack, Kylenamelly and Portumna. The last two named areas were partly afforested but are proposed for restoration under a Coillte E.U. LIFE Programme. The geographical location of these examples of limestone pavement within the country is notable.

A second priority Annex I habitat, *Cladium* fen, occurs occasionally along the lake margins, mainly in association with alkaline fens, Common Reed (*Phragmites australis*) and other swamp vegetation. Typically, Great Fen-sedge (*Cladium mariscus*), which can be up to 2 m in height, forms dense stands. Associated species include Common Reed, Black Bog-rush (*Schoenus nigricans*), Water Horsetail (*Equisetum fluviatile*), Bottle Sedge (*Carex rostrata*) and occasional Slender Sedge (*Carex lasiocarpa*). This community generally merges with alkaline fen dominated by Black Bog-rush, with Purple Moor-grass (*Molinia caerulea*), Marsh Horsetail (*E. palustre*), Meadowsweet (*Filipendula ulmaria*) and scattered tussocks of Greater Tussock-sedge (*Carex paniculata*).

Yew woods in Ireland are mostly confined to the west of the country. However, a substantial area of Yew is located on limestone at Cornalack, where Yew forms a scrub woodland along the east shore of Lough Derg. Here, Yew is found in association with small amounts of Juniper, which forms protection against grazing for the young Yew. Other notable species present include Hawthorn (*Crataegus monogyna*), Hazel (*Corylus avellana*), Holly (*Ilex aquifolium*), Small-leaved Cotoneaster (*Cotoneaster microphyllus*), along with occasional Ivy (*Hedera helix*), Wild Strawberry (*Fragaria vesca*), Bramble (*Rubus fruticosus* agg.) and Wood-sorrel (*Oxalis acetosella*). Elsewhere, small stands of Yew up to 5 m high occur with Spindle (*Euonymus europaeus*), Blackthorn (*Prunus spinosa*), Gorse (*Ulex europaeus*) and Ash (*Fraxinus excelsior*). Due to shading, and in places cattle trampling, the ground flora supports few herbs. However, the bryophyte layer is well developed with many moss covered rocks present.

Juniper occurs throughout this site in a range of habitats, associated with calcareous grasslands, heath and limestone outcrops. Some of the finest examples of Juniper formations in Ireland occur along the lake edge where upright, bushy Juniper shrubs up to 3 m tall are found. Typically, Juniper forms dense hedges with Ash, Hawthorn, Gorse, Hazel and Bramble, and occasional Yew. These tall Juniper shrubs are a unique feature in Ireland, where it is more typically found growing in prostrate form. In places along the lake shore Juniper forms a mosaic with Black Bog-rush and Great Fen-sedge fen. The best examples are seen at the north and north-east of the site. On drier ground above the flood level, Juniper occurs in association with species-rich calcareous grassland with Mouse-ear Hawkweed (*Hieracium pilosella*), Daisy (*Bellis perennis*), Lady's Bedstraw (*Galium verum*), Wild Thyme (*Thymus praecox*) and Blue Moor-grass (*Sesleria albicans*). An extensive area of this vegetation is seen north of Kilgarvan Quay. Many of the islands also support significant Juniper cover. This is particularly evident on Bounla Island. Juniper generally occurs as fringing vegetation around the islands, which typically have wooded centres. At Cornalack, along the eastern shore of Lough Derg, tall Juniper is found in association with loose limestone rubble with a significant cover of Yew.

Deciduous woodlands are also a notable feature of the site, dominated by oak (*Quercus* spp.), as at Bellevue, and Hazel/Ash at many of the examples along the north-eastern shore. Typically the ground layer includes Early-purple Orchid (*Orchis mascula*), violets (*Viola* spp.), Ivy, Lesser Celandine (*Ranunculus ficaria*), Bluebell (*Hyacinthoides non-scripta*), Wood Anemone (*Anemone nemorosa*), Wood-sorrel, Primrose (*Primula vulgaris*), Bramble, Ground Ivy (*Glechoma hederacea*), Pignut (*Conopodium majus*) and Honeysuckle (*Lonicera periclymenum*). Wet woodland is frequent along the lake shore, and in some areas this conforms well with the E.U. Annex I habitat, alluvial woodland. At Kylenamelly wood, where some planting of commercial forestry has occurred, there are extensive areas of alluvial woodland which are subject to flooding. These woods are dominated by willows (*Salix* spp.) and Alder (*Alnus glutinosa*), with Downy Birch (*Betula pubescens*) and Ash also present. The ground flora of the undisturbed alluvial sites is often dominated by Yellow Iris (*Iris pseudacorus*), with a range of other species commonly present, including Bogbean (*Menyanthes trifoliata*), Marsh-marigold (*Caltha palustris*),

Meadowsweet, Purple Loosestrife (*Lythrum salicaria*), horsetails (*Equisetum* spp.), Wild Angelica (*Angelica sylvestris*), Greater Tussock-sedge and Remote Sedge (*Carex remota*). Further examples of alluvial woodland occur at Portumna. Beech (*Fagus sylvatica*) and Scots Pine (*Pinus sylvestris*) are often present at the lake edge along areas which were once parts of estates. Some areas of coniferous forestry have been included within the site.

The only known site in the country for the Red Data Book plant Irish Fleabane (*Inula salicina*) occurs along the lake shore. This plant is legally protected under the Flora (Protection) Order, 1999. Other Red Data Book species present within this site are Marsh Pea (*Lathyrus palustris*) and Ivy Broomrape (*Orobanche hederae*). The Red Data Book stonewort *Chara tomentosa* has its stronghold in Lough Derg.

The lake is rated as nationally important for waterfowl. The entire lake, including all of the islands, is a designated SPA (Special Protection Area). Counts from 1995/96 carried out at seven locations on the lake indicate that the lake holds nationally important numbers for Mute Swan, Cormorant, Mallard, Teal, Tufted Duck and Goldeneye. The lake also supports a number of Greenland White-fronted Goose, a bird species listed on Annex I of the E.U. Birds Directive. There is a Wildlife Sanctuary at the north western edge of the lake.

Lough Derg is of conservation interest also for its fish and freshwater invertebrates. Lampreys, listed under Annex II of the E.U. Habitats Directive, are known to occur and the lake contains an apparently self-sustaining landlocked population of Sea Lamprey (*Petromyzon marinus*). A landlocked population, where the fish are feeding and not completing a seaward migration, is unique in an Irish context, though there are several such populations in the U.S. and one is known from Loch Lomond in Scotland. Brook Lamprey (*Lampetra planeri*) is known to be common in the lower Shannon catchment where all three lamprey species breed.

The endangered fish species Pollan (*Coregonus autumnalis pollan*) is recorded from Lough Derg, one of only three sites in Ireland and in western Europe. The Pollan is a landlocked species of Coregonid or 'White Fish', thought to have colonised Irish waters after the last Ice Age. Its nearest relative, the Arctic Cisco, is found as far away as Alaska, Northern Canada and Siberia. Although it is anadromous throughout most of its northern range, the Irish population are all non-migratory and purely freshwater. Lough Derg is also a well known fishing lake with a good Trout (*Salmo trutta*) fishery. Atlantic Salmon (*Salmo salar*) also use the lake as a spawning ground. Although this species is still fished commercially in Ireland, it is considered to be endangered or locally threatened elsewhere in Europe and is listed on Annex II of the E.U. Habitats Directive.

Otter and Badger have been recorded within the site. Both of these species are listed in the Irish Red Data Book and are legally protected by the Wildlife Act, 1976.

Land use within the site is mainly of a recreational nature with many boat hire companies, holiday home schemes and angling clubs located at the lake edge.

Recreational disturbance may pose a threat to the wintering wildfowl populations, though tourism is scaled down during the winter. The water body is surrounded mainly by improved pastoral farmland to the south and east, with areas of bog to the south-west and west. Coniferous plantations are present along the west and north-west shore and small areas of these are included within the site. If these areas are felled no further planting should take place as afforestation damages the wetland habitats between the plantation and lake edge.

The main threats to the quality of the site are water polluting activities resulting from intensification of agricultural activities around the lake shore, uncontrolled discharge of sewage, which is causing eutrophication of the lake, and housing and boating development which has resulted in the destruction of lakeshore habitats. There is also significant fishing and shooting pressure on and around the lake. Forestry can result in the loss of some areas of wetland habitat. The spread of Zebra Mussel (*Dreissena polymorpha*) in Lough Derg also poses a threat the ecology of the lake.

This is a site of significant ecological interest, with six habitats listed on Annex I of the E.U. Habitats Directive. Four of these are priority habitats - *Cladium* fen, alluvial woodland, limestone pavement and Yew woodland. Other annexed habitats present include alkaline fen and Juniper scrub formations on heath and calcareous grasslands. In addition, the lake itself is an SPA that supports important numbers of wintering wildfowl, Greenland White-fronted Goose, Common Tern and Cormorant, a number of which are listed under Annex I of the E.U. Birds Directive.

Site Name: Lower River Shannon SAC

Site Code: 002165

This very large site stretches along the Shannon valley from Killaloe in Co. Clare 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. 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 Killeenagarriff, Annagh, Newport, the Dead River, the Bilboa, Glashacloonaraveela, Gortnageragh and Cahernahallia.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1110] Sandbanks
[1130] Estuaries
[1140] Tidal Mudflats and Sandflats
[1150] Coastal Lagoons*
[1160] Large Shallow Inlets and Bays
[1170] Reefs
[1220] Perennial Vegetation of Stony Banks
[1230] Vegetated Sea Cliffs
[1310] *Salicornia* Mud
[1330] Atlantic Salt Meadows
[1410] Mediterranean Salt Meadows
[3260] Floating River Vegetation
[6410] *Molinia* Meadows
[91E0] Alluvial Forests*
[1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)
[1095] Sea Lamprey (*Petromyzon marinus*)
[1096] Brook Lamprey (*Lampetra planeri*)
[1099] River Lamprey (*Lampetra fluviatilis*)
[1106] Atlantic Salmon (*Salmo salar*)
[1349] Bottle-nosed Dolphin (*Tursiops truncatus*)
[1355] Otter (*Lutra lutra*)

The Shannon and Fergus Rivers 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.

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 eelgrass (*Zostera* spp.) beds 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. For example, 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. triquetrus*). 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 species Common Saltmarsh-grass (*P. maritima*) and Hard-grass (*Parapholis strigosa*).

Saltmarsh vegetation also occurs around a number of lagoons within the site, two of which have been surveyed as part of a National Inventory of Lagoons. 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 sluiced 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* subsp. *maritima*), Sea Campion (*Silene vulgaris* subsp. *maritima*), Thrift and plantains (*Plantago* spp.). A rare endemic type of sea-lavender, *Limonium recurvum* subsp. *pseudotranswallianum,* 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 Common 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.

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 the Purple Sea Urchin *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 18 m. 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 stony beaches and bedrock shores (these support a typical zonation of seaweeds such as *Fucus* spp., *Ascophyllum nodosum* and kelps), shingle beaches (with 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 (e.g. in the area from Kerry Head to Beal Head) and sand dunes (a small area occurs at Beal Point, where Marram – *Ammophila arenaria* is the dominant species).

Freshwater rivers have been included in the site, most notably the Feale and Mulkear catchments, the Shannon from Killaloe to Limerick (along with some of its tributaries, including a short stretch of the Kilmastulla River), the Fergus up as far as Ennis, and the Cloon River. These systems are very different in character: the Shannon is broad, generally slow flowing and naturally eutrophic; the Fergus is smaller and alkaline; while the narrow, fast flowing Cloon is acid in nature. The Feale and Mulkear catchments exhibit all the aspects of a river from source to mouth. Semi-natural habitats, such as wet grassland, wet woodland and marsh occur by the rivers, but improved grassland is the most common habitat type. 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 (*Juncus* spp.) and sedges (*Carex* spp.), and supporting a diverse and species-rich vegetation, including such uncommon species as Blue-eyed Grass (*Sisyrinchium bermudiana*) and Pale Sedge (*C. pallescens*).

Floating river vegetation characterised by species of water-crowfoot (*Ranunculus* spp.), pondweeds (*Potamogeton* spp.) and the moss *Fontinalius 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 Co. 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 50 m 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 Rusty Willow (*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 river side 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 Pedunculate Oak (*Quercus robur*), elm (*Ulmus glabra* and *U. procera*), Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*) and

the shrubs Guelder-rose (*Viburnum opulus*) and willows. The ground flora is species-rich.

While woodland is infrequent within the site, however Cahiracon Wood contains a strip of old oak woodland. Sessile Oak (*Q. 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 telmeteia*) 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 2 km 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 features prominent Great wood-rush and Bilberry (*Vaccinium myrtillus*), along with a typical range of woodland herbs. Bracken (*Pteridium aquilinum*) is a feature in areas where there is more light available.

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 approximately 5 km north-west of Cappamore in Co. Limerick. The bog contains some wet areas with good cover of bog mosses (*Sphagnum* spp.). Species of particular interest include Cranberry (*Vaccinium oxycoccos*) and White Sedge (*Carex curta*), along with two regionally rare mosses, including the bog moss *S. fimbriatum*. The site is being invaded by Downy Birch (*Betula pubescens*) scrub woodland. Both commercial forestry and the spread of Rhododendron (*Rhododendron ponticum*) has greatly reduced the overall value of the site.

A number of plant species that are listed in the Irish Red Data Book occur within the site, and several of these are protected under the Flora (Protection) Order, 1999. These include Triangular Club-rush (*Scirpus triquetrus*), a species which is only found in Ireland only in the Shannon Estuary, where it borders creeks in the inner estuary. Opposite-leaved Pondweed (*Groenlandia densa*) is found in the Shannon where it passes through Limerick City, while Meadow Barley (*Hordeum secalinum*) is abundant in saltmarshes at Ringmoylan and Mantlehill. Hairy Violet (*Viola hirta*) occurs in the Askeaton/Foynes area. Golden Dock (*Rumex maritimus*) is noted as occurring in the River Fergus estuary. Finally, Bearded Stonewort (*Chara canescens*), a brackish water specialist, and Convergent Stonewort (*Chara connivens*) are both found in Shannon Airport Lagoon.

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 (1,062; 1995/96), Curlew (1,504; 1995/96), Redshank (3,228; 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 Peregine 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 (4,010 individuals at Loop Head, 1987).

There is a resident population of Bottle-nosed Dolphin in the Shannon Estuary. This is the only known resident population of this E.U. Habitats Directive Annex II species in Ireland. The population is estimated (in 2006) to be 140 ± 12 individuals. 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 species 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 land uses 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 where it reflects the sewage load from Limerick City. Analyses for trace metals suggest a relatively clean estuary with no influences of industrial discharges apparent. Further industrial development along the Shannon and water polluting operations are potential threats.

Fishing is a main tourist attraction on the Shannon 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 habitats lagoon and alluvial woodland, 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.

Site Name: Lower River Suir SAC

Site Code: 002137

Lower River Suir SAC consists of the freshwater stretches of the River Suir immediately south of Thurles, the tidal stretches as far as the confluence with the Barrow/Nore immediately east of Cheekpoint in Co. Waterford, and many tributaries including the Clodiagh in Co. Waterford, the Lingaun, Anner, Nier, Tar, Aherlow, Multeen and Clodiagh in Co. Tipperary. The Suir and its tributaries flow through the counties of Tipperary, Kilkenny and Waterford.

Upstream of Waterford city, the swinging meanders of the Suir criss-cross the Devonian sandstone rim of hard rocks no less than three times as they leave the limestone-floored downfold below Carrick-on-Suir. In the vicinity of Carrick-on-Suir the river follows the limestone floor of the Carrick Syncline. Upstream of Clonmel the river and its tributaries traverse Upper Palaeozoic Rocks, mainly the Lower Carboniferous Visean and Tournaisian. The freshwater stretches of the Clodiagh River in Co. Waterford traverse Silurian rocks, through narrow bands of Old Red Sandstone and Lower Avonian Shales, before reaching the carboniferous limestone close to its confluence with the Suir. The Aherlow River flows through a Carboniferous limestone valley, with outcrops of Old Red Sandstone forming the Galtee Mountains to the south and the Slievenamuck range to the north. Glacial deposits of sands and gravels are common along the valley bottom, flanking the present-day river course.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[1330] Atlantic Salt Meadows
[1410] Mediterranean Salt Meadows
[3260] Floating River Vegetation
[6430] Hydrophilous Tall Herb Communities
[91A0] Old Oak Woodlands
[91E0] Alluvial Forests*
[91J0] Yew Woodlands*

[1029] Freshwater Pearl Mussel (*Margaritifera margaritifera*)
[1092] White-clawed Crayfish (*Austropotamobius pallipes*)
[1095] Sea Lamprey (*Petromyzon marinus*)
[1096] Brook Lamprey (*Lampetra planeri*)
[1099] River Lamprey (*Lampetra fluviatilis*)

[1103] Twaite Shad (*Alosa fallax*)
[1106] Atlantic Salmon (*Salmo salar*)
[1355] Otter (*Lutra lutra*)

Alluvial wet woodland is a declining habitat type in Europe as a result of drainage and reclamation. The best examples of this type of woodland in the site are found on the islands just below Carrick-on-Suir and at Fiddown Island. Species occurring here include Almond Willow (*Salix triandra*), White Willow (*S. alba*), Rusty Willow (*S. cinerea* subsp. *oleifolia*), Osier (*S. viminalis*), with Yellow Iris (*Iris pseudacorus*), Hemlock Water-dropwort (*Oenanthe crocata*), Wild Angelica (*Angelica sylvestris*), Pendulous Sedge (*Carex pendula*), Meadowsweet (*Filipendula ulmaria*) and Common Valerian (*Valeriana officinalis*). The terrain is littered with dead trunks and branches and intersected with small channels which carry small streams to the river. The bryophyte and lichen floras appear to be rich. A small plot is currently being coppiced and managed by the National Parks and Wildlife Service. In the drier areas species such as Ash (*Fraxinus excelsior*), Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*) and Blackthorn (*Prunus spinosa*) occur.

Eutrophic tall herb vegetation occurs in association with the various areas of alluvial forest and elsewhere where the floodplain of the river is intact. Characteristic species of the habitat include Meadowsweet, Purple Loosestrife (*Lythrum salicaria*), Marsh Ragwort (*Senecio aquaticus*), Ground Ivy (*Glechoma hederacea*) and Hedge Bindweed (*Calystegia sepium*).

Old oak woodlands are also of importance at the site. The best examples are seen in Portlaw Wood which lies on both sides of the Clodiagh River. On the south-facing side the stand is more open and the oaks (mainly Pedunculate Oak, *Quercus robur*) are well grown and spreading. Ivy (*Hedera helix*) and Bramble (*Rubus fruticosus* agg.) are common on the ground, indicating relatively high light conditions. Oak regeneration is dense, varying in age from 0-40 years and Holly (*Ilex aquifolium*) is fairly common but mostly quite young. Across the valley, by contrast, the trees are much more closely spaced and though taller, are poorly grown on average. There are no clearings; large oaks extend to the boundary wall. In the darker conditions, Ivy is much rarer and Holly much more frequent, forming a closed canopy in places. Oak regeneration is uncommon since there are as yet few natural clearings. The shallowness of the soil on the north-facing slope probably contributes to the poor tree growth there. The acid nature of the substrate has induced a 'mountain' type oakwood community to develop. The site is quite species-rich throughout, including an abundance of mosses, liverworts and lichens. The rare lichen *Lobaria pulmonaria,* an indicator of ancient woodlands, is found here.

Inchinsquillib Wood consists of three small separate sloping blocks of woodland in a valley cut by the young Multeen River and its tributaries through acidic Old Red Sandstone and Silurian rocks. Two blocks, both with an eastern aspect, located to the north of the road, are predominantly of Sessile Oak (*Quercus petraea*) and Hazel, with Downy Birch (*Betula pubescens*), Ash and Holly. The ground flora is quite mixed with,

for example, Wood-sedge (*Carex sylvatica*), Bluebell (*Hyacinthoides non-scripta*), Primrose (*Primula vulgaris*), Wood-sorrel (*Oxalis acetosella*), Pignut (*Conopodium majus*) and Hard Fern (*Blechnum spicant*). The base poor nature of the underlying rock is to some extent masked by the overlying drift. The third block, to the south of the road, and with a northern aspect, is a similar although less mature mixture of Sessile Oak, Birch and Holly. Here the influence of the drift is more marked, with the occurrence of Wood Anemone (*Anemone nemorosa*) amongst the ground flora.

Two stands of Yew (*Taxus baccata*) woods, a rare habitat in Ireland and the E.U., occur within the site. These are on limestone ridges at Shanbally and Cahir Park. Both are in woods planted with non-native species, including conifers. However, the area at Cahir Park is fairly substantial in size and includes some relatively undisturbed patches of wood and some very old trees. Regeneration of the Yew trees is mostly poor, due to competition from species such as Sycamore (*Acer pseudoplatanus*) and, at Shanbally, due to heavy grazing by goats. Other native species which occur with the Yew trees include Ash, Pedunculate Oak, Hazel and Spindle (*Euonymus europaeus*). Future prospects for these Yew woods are good as the sites are proposed for restoration under a Coillte E.U. LIFE programme.

Floating river vegetation is evident in the freshwater stretches of the River Suir and along many of its tributaries. Typical species found include Canadian Pondweed (*Elodea canadensis*), water-milfoils (*Myriophyllum* spp.), Fennel Pondweed (*Potamogeton pectinatus*), Curled Pondweed (*P. crispus*), Perfoliate Pondweed (*P. perfoliatus*), Pond Water-crowfoot (*Ranunculus peltatus*), other crowfoots (*Ranunculus* spp.) and the moss *Fontinalis antipyretica.* At a couple of locations along the river Opposite-leaved Pondweed (*Groenlandia densa*) occurs. This species is protected under the Flora (Protection) Order, 1999.

The Aherlow River is fast flowing and mostly follows a natural unmodified river channel. Submerged vegetation includes the aquatic moss *Fontinalis antipyretica* and Stream Water-crowfoot (*R. pencillatus*), while shallow areas support species such as Reed Canary-grass (*Phalaris arundinacea*), Brooklime (*Veronica beccabunga*) and Water Mint (*Mentha aquatica*). The river bank is fringed in places with Alder (*Alnus glutinosa*) and willows (*Salix* spp.).

The Multeen River is fast flowing, mostly gravel-bottomed and appears to follow a natural unmodified river channel. Water-crowfoots occur in abundance and the aquatic moss *Fontinalis antipyretica* is also common. In sheltered shallows, species such as Water-cress (*Nasturtium officinale*) and water-starworts (*Callitriche* spp.) occur. The river channel is fringed for most of its length with Alder, Willow and a narrow strip of marshy vegetation.

Salt meadows occur below Waterford City in old meadows where the embankment is absent, or has been breached, and along the tidal stretches of some of the in-flowing rivers below Little Island. There are very narrow, non-continuous bands of this habitat along both banks. More extensive areas are also seen along the south bank at Ballynakill, the east side of Little Island, and in three large salt meadows

between Ballynakill and Cheekpoint. The Atlantic and Mediterranean sub-types are generally intermixed. The species list is extensive and includes Red Fescue (*Festuca rubra*), oraches (*Atriplex* spp.), Sea Aster (*Aster tripolium*), Sea Couch (*Elymus pycnanthus*), frequent Sea Milkwort (*Glaux maritima*), occasional Wild Celery (*Apium graveolens*), Parsley Water-dropwort (*Oenanthe lachenalii*), English Scurvygrass (*Cochlearia anglica*) and Sea Arrowgrass (*Triglochin maritima*). These species are more representative of the Atlantic sub-type of the habitat. Common Cord-grass (*Spartina anglica*), is rather frequent along the main channel edge and up the internal channels. The legally protected (Flora (Protection) Order, 1999) Meadow Barley (*Hordeum secalinum*) grows at the landward transition of the saltmarsh. Sea Rush (*Juncus maritimus*), an indicator of the Mediterranean salt meadows, also occurs.

Other habitats at the site include wet and dry grassland, marsh, reedswamp, improved grassland, coniferous plantations, deciduous woodland, scrub, tidal river, stony shore and mudflats. The most dominant habitat adjoining the river is improved grassland, although there are wet fields with species such as Yellow Iris, Meadowsweet, rushes (*Juncus* spp.), Meadow Buttercup (*Ranunculus acris*) and Cuckooflower (*Cardamine pratensis*).

Cabragh marshes, just below Thurles, lie in a low-lying tributary valley into which the main river floods in winter. Here there is an extensive area of Common Reed (*Phragmites australis*) with associated marshland and peaty fen. The transition between vegetation types is often well displayed. A number of wetland plants of interest occur, in particular the Narrow-leaved Bulrush (*Typha angustifolia*), Bottle Sedge (*Carex rostrata*) and Blunt-flowered Rush (*Juncus subnodulosus*). The marsh is naturally eutrophic but it has also the nutritional legacy of the former sugar factory which discharged into it through a number of holding lagoons, now removed. Production is high, which is seen in the size of such species as Celery-leaved Buttercup (*Ranunculus sceleratus*), as well as in the reeds themselves.

Throughout the Lower River Suir site are small areas of woodland other than those described above. These tend to be a mixture of native and non-native species, although there are some areas of semi-natural wet woodland with species such as Ash and willow. Cahir Park Woodlands is a narrow tract of mixed deciduous woodland lying on the flat-lying floodplain of the River Suir. This estate woodland was planted over one hundred years ago and it contains a large component of exotic tree species. However, due to original planting and natural regeneration there is now a good mix of native and exotic species. About 5 km north-west of Cashel, Ardmayle pond is a long, possibly artificial water body running parallel to the River Suir. It is partly shaded by planted Lime (*Tilia* hybrids), Sycamore and the native Alder. Growing beneath the trees are shade tolerant species such as Remote sedge (*Carex remota*).

The site is of particular conservation interest for the presence of a number of Annex II animal species, including Freshwater Pearl Mussel (both *Margaritifera margaritifera* and *M. margaritifera* subsp. *durrovensis* occur), White-clawed Crayfish, Salmon, Twaite Shad (*Alosa fallax fallax*), three species of Lampreys - Sea Lamprey, Brook

Lamprey and River Lamprey, and Otter. This is one of only three known spawning grounds in the country for Twaite Shad.

The site also supports populations of several other animal species. Those which are listed in the Irish Red Data Book include Daubenton's Bat, Nattererer's Bat, Pipistrelle Bat, Pine Marten, Badger, Irish Hare, Smelt and Common Frog. Breeding stocks of Carp are found in Kilsheelan Lake. This is one of only two lakes in the country which is known to have supported breeding Carp. Carp require unusually high summer water temperatures to breed in Ireland. As the site is therefore unusual in this regard, it may also support interesting invertebrate populations.

Parts of the site have also been identified as of ornithological importance for a number of Annex I (E.U. Birds Directive) bird species, including Greenland White-fronted Goose (10), Golden Plover (1,490), Whooper Swan (7) and Kingfisher. Figures given in brackets are the average maximum counts from four count areas within the site for the three winters 1994-1997. Wintering populations of migratory birds use the site. Flocks are seen in Coolfinn Marsh and also along the reedbeds and saltmarsh areas of the Suir. Coolfinn supports nationally important numbers of Greylag Goose on a regular basis, with numbers between 600 and 700 recorded. Other species occurring include Mallard (21), Teal (159), Wigeon (26), Tufted Duck (60), Pintail (4), Pochard (2), Little Grebe (2), Black-tailed Godwit (20), Oystercatcher (16), Lapwing (993), Dunlin (101), Curlew (195), Redshank (28), Greenshank (4) and Green Sandpiper (1). Nationally important numbers of Lapwing (2,750) were recorded at Faithlegg in the winter of 1996/97. In Cabragh marshes there is abundant food for surface feeding wildfowl which total approximately 1,000 in winter. Widgeon, Teal and Mallard are numerous, and the latter has a large breeding population, with up to 400 in summer. In addition, less frequent species like Shoveler and Pintail occur and there are records for both Whooper and Bewick's swans. Kingfisher, a species that is listed on Annex I of the E.U. Birds Directive, occurs along some of the many tributaries throughout the site.

Land use at the site consists mainly of agricultural activities including grazing, silage production, fertilising and land reclamation. The grassland is intensively managed and the rivers are therefore vulnerable to pollution from run-off of fertilisers and slurry. Arable crops are also grown. Fishing is a main tourist attraction on stretches of the Suir and some of 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. The Aherlow River is a designated Salmonid Water under the E.U. Freshwater Fish Directive. Other recreational activities such as boating, golfing and walking are also popular. Several industrial developments, which discharge into the river, border the site including three dairy related operations and a tannery.

The Lower River Suir contains excellent examples of a number of Annex I habitats, including the priority habitats alluvial forest and Yew woodland. The site also supports populations of several important animals species, some listed on Annex II of the Habitats Directive or listed in the Irish Red Data Book. The presence of two

legally protected plants (Flora (Protection) Order, 1999) and the ornithological importance of the site adds further to the ecological interest and importance.

Site Name: Philipston Marsh SAC

Site Code: 001847

Philipston Marsh is a small wetland near Philipston House, south of Cappagh White in Co. Tipperary. It represents one of only two examples of calcareous fen and mire vegetation in the Mulkear River catchment and is thus a rare habitat type in this locality.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[7140] Transition Mires

The marsh supports a dense reedbed of Common Reed (*Phragmites australis*) and patches of Rusty Willow (*Salix cinerea* subsp. *oleifolia*) scrub on its northern margins. The southern part is flushed with calcareous groundwater issuing from the base of a gentle slope. This area supports a very species-rich mosaic of fen and transition mire plant communities, amongst which are found several uncommon species, including Broad-leaved Cottongrass (*Eriophorum latifolium*), Marsh Helleborine (*Epipactis palustris*), Fen Bedstraw (*Galium uliginosum*), Lesser Tussock-sedge (*Carex diandra*) and Long-stalked Yellow-sedge (*C. lepidocarpa*). Typical rich fen bryophytes, such as *Campylium stellatum*, *Drepanocladus revolvens*, *Ctenidium molluscum*, *Fissidens adianthoides*, *Philonotis calcarea* and *Palustriella commutate,* are largely confined to Philipston Marsh within the Mulkear River catchment.

This undisturbed fen and mire system supports an unusual and diverse assemblage of plant communities and is particularly important for its transition mire, a habitat listed on Annex I of the E.U. Habitats Directive.

REFERENCE DOCUMENT

Site Name: Ratty River Cave SAC

Site Code: 002316

This site lies approximately 2.5 km north of Sixmilebridge in Co. Clare. It consists of a cave, and also an important winter roost and a breeding site of the Lesser Horseshoe Bat.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[8310] Caves
[1303] Lesser Horseshoe Bat (*Rhinolophus hipposideros*)

The cave in Ratty River Cave SAC is a natural fossil limestone cave set into the east-facing bank of Ratty River (also known as Owenogarney River). The cave entrance is overgrown with Bramble (*Rubus fruticosus* agg.). Inside the entrance there is a low crawl, but the cave opens into a main chamber before diverging into two tunnels. This cave has not been documented, but habitats present include rock roof and walls, and stalactites. The floor features are particularly notable because of their pristine condition. The cave is not known to flood.

Lesser Horseshoe Bats have been using the cave beside the Ratty River as a hibernation site for some years. During the winter of 2001, 187 bats were recorded here making it a site of international importance. A stretch of river and the bankside vegetation are included in the site as these are used by commuting bats. A derelict cottage which is situated nearby is also included as it contains a maternity roost of Lesser Horseshoe Bats. A total of 65 bats were recorded here in July 1998. The foraging areas used by these bats have yet to be established.

Neither roost is subject to disturbance and there are no other known threats to this site at present.

SITE SYNOPSIS

SITE NAME: RIVER SHANNON AND RIVER FERGUS ESTUARIES SPA

SITE CODE: 004077

The estuaries of the River Shannon and River Fergus form the largest estuarine complex in Ireland. The site comprises the entire estuarine habitat from Limerick City westwards as far as Doonaha in Co. Clare and Dooneen Point in Co. Kerry.

The site has vast expanses of intertidal flats which contain a diverse macro-invertebrate community, e.g. *Macoma-Scrobicularia-Nereis*, which provides a rich food resource for the wintering birds. Salt marsh vegetation frequently fringes the mudflats and this provides important high tide roost areas for the wintering birds. Elsewhere in the site the shoreline comprises stony or shingle beaches.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for the following species: Cormorant, Whooper Swan, Light-bellied Brent Goose, Shelduck, Wigeon, Teal, Pintail, Shoveler, Scaup, Ringed Plover, Golden Plover, Grey Plover, Lapwing, Knot, Dunlin, Black-tailed Godwit, Bar-tailed Godwit, Curlew, Redshank, Greenshank and Black-headed Gull. It is also of special conservation interest for holding an assemblage of over 20,000 wintering waterbirds. The E.U. Birds Directive pays particular attention to wetlands and, as these form part of this SPA, the site and its associated waterbirds are of special conservation interest for Wetland & Waterbirds.

The site is the most important coastal wetland site in the country and regularly supports in excess of 50,000 wintering waterfowl (57,133 - five year mean for the period 1995/96 to 1999/2000), a concentration easily of international importance. The site has internationally important populations of Light-bellied Brent Goose (494), Dunlin (15,131), Black-tailed Godwit (2,035) and Redshank (2,645). A further 17 species have populations of national importance, i.e. Cormorant (245), Whooper Swan (118), Shelduck (1,025), Wigeon (3,761), Teal (2,260), Pintail (62), Shoveler (107), Scaup (102), Ringed Plover (223), Golden Plover (5,664), Grey Plover (558), Lapwing (15,126), Knot (2,015), Bar-tailed Godwit (460), Curlew (2,396), Greenshank (61) and Black-headed Gull (2,681) - figures are five year mean peak counts for the period 1995/96 to 1999/2000. The site is among the most important in the country for several of these species, notably Dunlin (13 % of national total), Lapwing (6% of national total) and Redshank (9% of national total).

The site also supports a nationally important breeding population of Cormorant (93 pairs in 2010).

Other species that occur include Mute Swan (103), Mallard (441), Red-breasted Merganser (20), Great Crested Grebe (50), Grey Heron (38), Oystercatcher (551),

Turnstone (124) and Common Gull (445) - figures are five year mean peak counts for the period 1995/96 to 1999/2000.

Apart from the wintering birds, large numbers of some species also pass through the site whilst on migration in spring and/or autumn.

The River Shannon and River Fergus Estuaries SPA is an internationally important site that supports an assemblage of over 20,000 wintering waterbirds. It holds internationally important populations of four species, i.e. Light-bellied Brent Goose, Dunlin, Black-tailed Godwit and Redshank. In addition, there are 17 species that have wintering populations of national importance. The site also supports a nationally important breeding population of Cormorant. Of particular note is that three of the species which occur regularly are listed on Annex I of the E.U. Birds Directive, i.e. Whooper Swan, Golden Plover and Bar-tailed Godwit. Parts of the River Shannon and River Fergus Estuaries SPA are Wildfowl Sanctuaries.

Site Name: Silvermine Mountains SAC

Site Code: 000939

This small site is situated on the northern slopes of the Silvermine Mountains, 1 km south-east of Silvermines village in Co. Tipperary. It slopes steeply uphill from 240 m in the north-west corner to 400 m at the southern boundary. The geology of the area is sandstone of different ages - older Silurian on the central part of the mountain, while the outer parts are composed of yellowish and red sandstones of Devonian age.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[4010] Wet Heath
[6230] Species-rich *Nardus* Grassland*

The site supports species-rich *Nardus* grasslands on siliceous substrates. This grassland occurs in two separate locations on either side of the road which cuts through the site. Typical species associated with the habitat and recorded at the site include Heath Bedstraw (*Galium saxatile*), Sheep's-fescue (*Festuca ovina*), Bitter-vetch (*Lathyrus montanus*), Heath Milkwort (*Polygala serpyllifolia*), Lesser Butterfly-orchid (*Platanthera bifolia*), Greater Butterfly-orchid (*P. chlorantha*), Lousewort (*Pedicularis sylvatica*), Tormentil (*Potentilla erecta*), Mat-grass (*Nardus stricta*) and Small-white Orchid (*Pseudorchis albida*).

Heath is the most extensive habitat of the site and is dominated by Heather (*Calluna vulgaris*), Purple Moor-grass (*Molinia caerulea*) and Bilberry (*Vaccinium myrtillus*), and occurs mainly on peaty soils. Localised, flushed, wet areas dominated by rushes (*Juncus effusus* and *J. acutiflorus*), with Marsh Arrowgrass (*Triglochin palustris*), Meadow Thistle (*Cirsium dissectum*) and Common Butterwort (*Pinguicula vulgaris*) are also present.

Scrub vegetation dominated by Rowan (*Sorbus aucuparia*), Rusty Willow (*Salix cinerea* subsp. *oleifolia*), Hawthorn (*Crataegus monogyna*), Hazel (*Corylus avellana*), and grading into Downy Birch (*Betula pubescens*), is well developed in the more inaccessible areas, such as the gullies at the western edge of the site. In places it encroaches on to grassland, probably due to under-grazing. Dense Bracken (*Pteridium aquilinum*) is also present.

Red Grouse is known from the site, as well as the Irish Hare, Common Frog and Common Lizard.

The occurrence of the Small-white Orchid at this site is of particular note as it is a Red Data Book species which is legally protected under the Flora (Protection) Order, 1999.

Land use within the site is confined to low density grazing by cattle, sheep and perhaps horses.

This site is of conservation importance due to the presence of two habitats listed in Annex I of the E.U. Habitats Directive, namely wet heath and species-rich *Nardus* grassland, the latter being listed with priority status. The occurrence of the rare Small-white Orchid adds significantly to the value of the site.

30.5.2015

Site Name: Silvermines Mountains West SAC

Site Code: 002258

Silvermines Mountains West SAC is situated to the north of Keeper Hill, about 10 km south of Nenagh in Co. Tipperary. Reaching an altitude of 489 m, this rather steep ridge of Old Red Sandstone is visibly very prominent in the landscape when viewed from the Nenagh to Limerick road. The site includes the summit and slopes, mostly above 200 m, to the west of an extensively afforested area south of the town of Silvermines.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[4010] Wet Heath
[4030] Dry Heath
[6130] Calaminarian Grassland

The main habitats that occur within Silvermines Mountains West SAC are heath (mostly wet heath but some dry heath) and unimproved upland grassland. The wet heath is particularly well developed with tall stands of Heather (*Calluna vulgaris*) and a high cover of bog mosses (*Sphagnum* spp.). Other species of wet heath include Deergrass (*Scirpus cespitosus*), cottongrasses (*Eriophorum angustifolium* and *E. vaginatum*), Purple Moor-grass (*Molinia caerulea*), Cross-leaved Heath (*Erica tetralix*), Tormentil (*Potentilla erecta*) and Heath Rush (*Juncus squarrosus*). Smaller areas of more species-rich wet heath with Hard Fern (*Blechnum spicant*), Mat-grass (*Nardus stricta*) and Great Wood-rush (*Luzula sylvatica*) also occur. From east to west there is a gradation from wet to dry heath, and from peaty to mineral soil. Dry heath, characterised by Western Gorse (*Ulex gallii*) and Bell Heather (*Erica cinerea*), is also found on the more steeply sloping ground below the summit ridge and on outcropping rock exposures. Gorse (*Ulex europaeus*) has invaded dry heath areas on the sides of some of the streams. Patchy remnants of blanket bog occur on the summit plateau in places and there is evidence of extensive former peat-cutting here.

Calaminarian Grassland vegetation is extensive (0.9 ha) and well developed at Shallee, an extensive old lead mine on the northern side of the site, with much the largest of the four Irish populations of the rare moss *Ditrichum plumbicola* and a tiny amount of the rare liverwort *Cephaloziella nicholsonii*. Threats are obvious from ongoing restoration work on an engine house ruin, and existence of large areas of derelict land with rusting oil drums, cables and dangerous open adits and workings.

Upland grassland is widespread on the lower mountain slopes, in many of the upper fields and on the steep south-facing slopes. Grassland also extends up onto the ridge at the western end of the site. Common species that characterise this acid grassland vegetation include Sheep's-fescue (*Festuca ovina*), Mat-grass, Common Bent (*Agrostis capillaris*), Crested Dog's-tail (*Cynosurus cristatus*), Germander Speedwell (*Veronica chamaedrys*), Tormentil, Heath Bedstraw (*Galium saxatile*) and a range of mosses such as *Rhytidiadelphus squarrosus*, *Hylocomium splendens* and *Brachythecium rutabulum*. Parts of the lower southern slopes are covered with dense Bracken (*Pteridium aquilinum*).

A number of small streams and flushes descend the slopes. These sometimes support a richer vegetation, with plants such as rushes (*Juncus effusus* and *J. articulatus*), sedges (*Carex nigra*, *C. panicea*, *C. lepidocarpa*, *C. echinata*, *C. ovalis* and *C. pulicaris*) and a variety of herbs, including Meadowsweet (*Filipendula ulmaria*), Ragged-Robin (*Lychnis flos-cuculi*), Bog Pimpernel (*Anagallis tenella*), Water Mint (*Mentha aquatica*) and Marsh Violet (*Viola palustris*).

The site is also important for birds. Up to 11 pairs of Hen Harriers are known to use these uplands as part of a wider range between Silvermines and Slieve Felim to the south. Hen Harriers are uncommon birds, and are listed under Annex I of the E.U. Birds Directive. The Silvermines provide useful foraging habitat for some of these birds.

The vegetation at this site is in good condition, with low grazing pressure throughout and no signs of over-grazing. One fifth of the site was burned in 2003 and there is evidence of former burning in another fifth. Former peat-cutting has occurred on the summit plateau and parts of the northern slopes. Afforestation, which is widespread to the east of the site, remains the greatest threat.

The site is of conservation importance for its heath and grassland vegetation, and as a foraging area for Hen Harrier, and is one of the only extensive unplanted uplands remaining in north Tipperary.

Site Name: Slieve Bernagh Bog SAC

Site Code: 002312

Slieve Bernagh Bog is situated to the west of Lough Derg, in the south-east of Co. Clare. The site comprises the Slieve Bernagh mountain range, with the highest peaks at Moylussa (532 m) and Cragnamurragh (526 m), and the surrounding peatlands that flank its northern slopes.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[4010] Wet Heath
[4030] Dry Heath
[7130] Blanket Bogs (Active)*

The summit plateau in Slieve Bernagh Bog SAC stretches from Lough Avullig, in the west, to Moylussa, in the east, and is dominated by mountain blanket bog of varying peat depth and condition. At the western end the terrain is undulating and some areas of peat are shallow and eroded in parts. Further east the terrain is flatter, the peat depth much greater (> 4 m) and the surface wetter. In general the vegetation is dominated by typical blanket bog species such as Deergrass (*Scirpus cespitosus*), Heather (*Calluna vulgaris*), Hare's-tail Cottongrass (*Eriophorum vaginatum*) and Common Cottongrass (*E. angustifolium*), with local differences in soil, slope and exposure determining their relative abundance. Other frequent species in the vegetation include Bog Asphodel (*Narthecium ossifragum*), Bilberry (*Vaccinium myrtillus*), Heath Milkwort (*Polygala serpyllifolia*), Purple Moor-grass (*Molinia caerulea*), Tormentil (*Potentilla erecta*), Cross-leaved Heath (*Erica tetralix*) and species characteristic of mountain blanket bog such as Crowberry (*Empetrum nigrum*) and Fir Clubmoss (*Huperzia selago*). Moss cover is variable, but in the wetter areas can be high (approx. 80% ground cover) and mainly dominated by bog mosses, such as *Sphagnum capillifolium* and *S. papillosum*, together with *Hypnum jutlandicum*, *Hylocomium splendens*, *Racomitrium lanuginosum* and occasional *Aulacomnium palustre* and *Dicranum scoparium*. Small pool systems near Moylussa contain floating carpets of *Sphagnum cuspidatum,* with patches of Common Cottongrass.

Blanket bog also occurs on the low-lying flanks of the mountain range, in the townlands of Ballybroghan and Ballydonaghan. Here the bog is much wetter, with pool systems of bog mosses, and species characteristic of western lowland blanket bog such as *Pleurozia purpurea* and *Campylopus atrovirens*.

Wet heath vegetation has developed on the slopes beneath the mountain summits and in mosaic with blanket bog on the shallower peat soils. Wet heath is especially well developed on the northern slopes below Cragnamurragh. Here the cover of Heather and Bilberry is high and a wide range of typical associates occur, including Hard Fern (*Blechnum spicant*), Cross-leaved Heath, Bell Heather (*Erica cinerea*), Crowberry, cottongrasses, Great Wood-rush (*Luzula sylvatica*), sedges (*Carex binervis*, *C. panicea* and *C. echinata*), rushes (*Juncus effusus* and *J. squarrosus*). The range of moss and liverwort species in this community is exceptionally diverse and includes a number of epiphytes growing on Eared Willow (*Salix aurita*).

On the drier, south facing slopes a dry heath community occurs in mosaic with upland grassland. Here species such as Bell Heather, Mat-grass (*Nardus stricta*), Sheep's-fescue (*Festuca ovina*), Common Bent (*Agrostis capillaris*), Tormentil and Heath Bedstraw (*Galium saxatile*) are prominent. Moss cover is low, mainly characterised by species such as *Hypnum jutlandicum*. In wetter areas, rushes (*Juncus effusus* and *J. articulatus*) become dominant.

Several species of birds, typical of open moorland, have been recorded from this site. These include Skylark, Meadow Pipit, Red Grouse, Wheatear and Raven. At least two pairs of Hen Harriers are known to occur within the Slieve Bernagh to Keeper Hill region, and birds use the cSAC for foraging habitat. This species is listed on Annex I of the E.U. Birds Directive.

The Irish Hare, a Red Data Book species, occurs within the site.

Land use within the site consists of some peat cutting to the north-west of the summit and low intensity sheep grazing confined to the lower grassy slopes. The site is, however, almost entirely surrounded by coniferous forest plantations and this remains the greatest threat.

Slieve Bernagh Bog is a site of considerable conservation importance as it contains a range of peatland types, including active blanket bog, a habitat listed with priority status under the E.U. Habitats Directive. It is one of the last remaining areas of intact open moorland habitat in this part of the country.

SITE SYNOPSIS

SITE NAME: SLIEVEFELIM TO SILVERMINES MOUNTAINS SPA

SITE CODE: 004165

The Slievefelim to Silvermines Mountains SPA is an extensive upland site located in Counties Tipperary and Limerick. Much of the site is over 200 m in altitude and rises to 694 m at Keeper Hill. Other peaks included in the site are Slieve Felim, Knockstanna, Knockappul, Mother Mountain, Knockteige, Cooneen Hill and Silvermine Mountain. The site is underlain mainly by sandstones of Silurian age. Several important rivers rise within the site, including the Mulkear, Bilboa and Clare.

The site consists of a variety of upland habitats, though approximately half is afforested. The coniferous forests include first and second rotation plantations, with both pre-thicket and post-thicket stands present. Substantial areas of clear-fell are also present at any one time. The principal tree species present are Sitka Spruce (*Picea sitchensis*) and Lodgepole Pine (*Pinus contorta*). Roughly one-quarter of the site is unplanted blanket bog and heath, with both wet and dry heath present. The bog and heath vegetation includes such typical species as Ling Heather (*Calluna vulgaris*), Bilberry (*Vaccinium myrtillus*), Bell Heather (*Erica cinerea*), Common Cottongrass (*Eriophorum angustifolium*), Hare's-tail Cottongrass (*Eriophorum vaginatum*), Deergrass (*Scirpus cespitosus*) and Purple Moor-grass (*Molinia caerulea*). The remainder of the site is mostly rough grassland that is used for hill farming. This varies in composition and includes some wet areas with rushes (*Juncus* spp.) and some areas subject to scrub encroachment. Some stands of deciduous woodland also occur, especially within the river valleys.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for Hen Harrier.

The site is one of the strongholds for Hen Harrier in the country. A survey in 2005 recorded five breeding pairs in the SPA, while nine pairs had been recorded in the 1998-2000 period. These numbers recorded in 2005 represent 3.7 % of the all-Ireland total. The mix of forestry and open areas provides optimum habitat conditions for this rare bird, which is listed on Annex I of the E.U. Birds Directive. The early stages of new and second-rotation conifer plantations are the most frequently used nesting sites, though some pairs may still nest in tall heather of unplanted bogs and heath. Hen Harriers will forage up to *c*. 5 km from the nest site, utilising open bog and moorland, young conifer plantations and hill farmland that is not too rank. Birds will often forage in openings and gaps within forests. In Ireland, small birds and small mammals appear to be the most frequently taken prey.

The site is also a traditional breeding site for a pair of Peregrine. Merlin has been recorded within the site but further survey is required to determine its status. Red Grouse is found on some of the unplanted areas of bog and heath – this is a species that has declined in Ireland and is now Red-listed.

The Slievefelim to Silvermines Mountains SPA is of ornithological importance because it provides excellent nesting and foraging habitat for breeding Hen Harrier and is one of the top sites in the country for the species. The presence of three species, Hen Harrier, Merlin and Peregrine, which are listed on Annex I of the E.U. Birds Directive is of note.

20.1.2015

SITE SYNOPSIS

SITE NAME: STACK'S TO MULLAGHAREIRK MOUNTAINS, WEST LIMERICK HILLS AND MOUNT EAGLE SPA

SITE CODE: 004161

The Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA is a very large site centred on the borders between the counties of Cork, Kerry and Limerick. The site is skirted by the towns of Newcastle West, Ballydesmond, Castleisland, Tralee and Abbeyfeale. The mountain peaks included in the site are not notably high or indeed pronounced, the highest being at Knockfeha (451 m). Other mountains included are Mount Eagle, Knockanefune, Garraunbaun, Taur, Rock Hill, Knockacummer, Mullaghamuish, Knight's Mt, Ballincollig Hill, Beennageeha Mt, Sugar Hill, Knockanimpuba and Knockathea, amongst others. Many rivers rise within the site, notably the Blackwater, Owentaraglin, Owenkeal, Glenlara, Feale, Clydagh, Allaghaun, Allow, Oolagh, Galey and Smerlagh.

The site consists of a variety of upland habitats, though almost half is afforested. The coniferous forests include first and second rotation plantations, with both pre-thicket and post-thicket stands present. Substantial areas of clear-fell are also present at any one time. The principal tree species present are Sitka Spruce (*Picea sitchensis*) and Lodgepole Pine (*Pinus contorta*). A substantial part (28%) of the site is unplanted blanket bog and heath, with both wet and dry heath present. The vegetation of these habitats is characterised by such species as Ling Heather (*Calluna vulgaris*), Bilberry (*Vaccinium myrtillus*), Common Cottongrass (*Eriophorum angustifolium*), Hare's-tail Cottongrass (*Eriophorum vaginatum*), Deergrass (*Scirpus cespitosus*) and Purple Moor-grass (*Molinia caerulea*). The remainder of the site is mostly rough grassland that is used for hill farming. This varies in composition and includes some wet areas with rushes (*Juncus* spp.) and some areas subject to scrub encroachment.

The site is a Special Protection Area (SPA) under the E.U. Birds Directive, of special conservation interest for Hen Harrier.

This SPA is a stronghold for Hen Harrier and supports the largest concentration of the species in the country. A survey in 2005 recorded 45 pairs, which represents over 20% of the all-Ireland total. A similar number of pairs had been recorded in the 1998-2000 period. The mix of forestry and open areas provides optimum habitat conditions for this rare bird, which is listed on Annex I of the E.U. Birds Directive. The early stages of new and second-rotation conifer plantations are the most frequently used nesting sites, though some pairs may still nest in tall heather of unplanted bogs and heath. Hen Harriers will forage up to *c*. 5 km from the nest site, utilising open bog and moorland, young conifer plantations and hill farmland that is not too rank. Birds will often forage in openings and gaps within forests. In Ireland, small birds and small mammals appear to be the most frequently taken prey.

Short-eared Owl, a very rare species in Ireland, has been known to breed within the site. Nesting certainly occurred in the late 1970s and birds have been recorded intermittently since. The owls are considered to favour this site due to the presence of Bank Voles, a favoured prey item. Merlin also breed within the site but the size of the population is not known. Red Grouse is found on some of the unplanted areas of bog and heath – this is a species that has declined in Ireland and is now Red-listed.

The Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA is of ornithological importance because it provides excellent nesting and foraging habitat for breeding Hen Harrier and is one the top sites in the country for the species. The presence of three species, Hen Harrier, Merlin and Short-eared Owl, which are listed on Annex I of the E.U. Birds Directive is of note.

20.1.2015

REFERENCE DOCUMENT

Site Name: Tory Hill SAC

Site Code: 000439

Tory Hill is an isolated, wooded limestone hill situated about 2 km north-east of Croom, Co. Limerick. It represents an important feature of the surrounding countryside and is a prime example of a limestone hill set amongst a region of volcanic intrusions of differing shape and geology. The hill is of geomorphological interest for the end-moraine, left by retreating ice, on its northern flanks and for ice-marks that are clearly visible on the solid rock. The site includes Lough Nagirra and its associated wetland vegetation, located to the north and north-east of Tory Hill.

The site is a Special Area of Conservation (SAC) selected for the following habitats and/or species listed on Annex I / II of the E.U. Habitats Directive (* = priority; numbers in brackets are Natura 2000 codes):

[6210] Orchid-rich Calcareous Grassland*
[7210] *Cladium* Fens*
[7230] Alkaline Fens

Tory Hill supports areas of scrub and woodland, with Hazel (*Corylus avellana*), Hawthorn (*Crataegus monogyna*) and Blackthorn (*Prunus spinosa*) comprising the main woody species found. The larger stands have a typical woodland flora. A well-developed limestone heath-scrub complex occurs on its western edge, which is very similar to the terrain found in the Burren region. This area is remarkable for its stand of Yew (*Taxus baccata*), a feature now rare in Ireland, and for its species-rich flora, which includes such calcium-loving plants as Fairy Flax (*Linum catharticum*), Quaking-grass (*Briza media*), Yellow Oat-grass (*Trisetum flavescens*) and Shining Crane's-bill (*Geranium lucidum*).

Areas of orchid-rich calcareous grassland are found on the eastern side of the hill and on its summit. A disused quarry also contains excellent examples of this grassland type. Four orchid species have been recorded here - Bee Orchid (*Ophrys apifera*), Pyramidal Orchid (*Anacamptis pyramidalis*), Early-purple Orchid (*Orchis mascula*) and Common Spotted-orchid (*Dactylorhiza fuchsii*). Other plant species of calcareous grassland present in this habitat include Carline Thistle (*Carlina vulgaris*), Yellow-wort (*Blackstonia perfoliata*), Wild Thyme (*Thymus praecox*), Crested Hair-grass (*Koeleria macrantha*), Downy Oat-grass (*Avenula pubescens*), Glaucous Sedge (*Carex flacca*), Hairy Rock-cress (*Arabis hirsuta*), Cowslip (*Primula veris*), Wild Carrot (*Daucus carota*), Red Fescue (*Festuca rubra*), Fairy Flax, Quaking-grass and Yellow Oat-grass, amongst others. The presence of the scarce Bee Orchid is of particular note.

Lough Nagirra has a thick fringe of Common Reed (*Phragmites australis*) and areas of alkaline fen and calcareous fen vegetation referable to the Caricion davallianae alliance with Great Fen-sedge (*Cladium mariscus*). Both of these fen types are listed on Annex I of the E.U. Habitats Directive, the latter with priority status.

A dense fringe of tall vegetation occurs around Lough Nagirra. Here, Great Fen-sedge (*Cladium mariscus*) is well-represented, along with Common Reed (*Phragmites australis*) and Reed Canary-grass (*Phalaris arundinacea*). The alkaline fen is relatively species-rich, with typical species including Black Bog-rush (*Schoenus nigricans*), Blunt-flowered Rush (*Juncus subnodulosus*), Brown Sedge (*Carex disticha*), Long-stalked Yellow-sedge (*C. lepidocarpa*), Common Sedge (*C. nigra*), Hairy Sedge (*C. hirta*), Glaucous Sedge (*C. flacca*), Carnation Sedge (*C. panicea*), Devil's-bit Scabious (*Succisa pratensis*), Early Marsh-orchid (*Dactylorhiza incarnata*) and Common Spotted-orchid (*D. fuchsii*), amongst others.

This site is of considerable conservation significance for the diversity of terrestrial and wetland habitats found within it, and particularly for the presence of good examples of three habitats that are listed on Annex I of the E.U. Habitats Directive.

Whole Upperchurch Windfarm Project

Natura Impact Statement
for
Whole UWF Project Elements 1 to 5

May 2018

Appendix A2: European Site Conservation Objectives

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ECOPOWER

Whole Upperchurch Windfarm Project

Natura Impact Statement for Project Elements 1-5

Appendix A2 European Site Conservation Objectives

May 2018

Inis

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Conservation objectives for Anglesey Road SAC [002125]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	Description
6230	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)*

* denotes a priority habitat

Citation: *NPWS (2018) Conservation objectives for Anglesey Road SAC [002125]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Askeaton Fen Complex SAC 002279

An Roinn
Cultúir, Oidhreachta agus Gaeltachta

Department of
Culture, Heritage and the Gaeltacht

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Citation:

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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002279	Askeaton Fen Complex SAC
7210	Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae*
7230	Alkaline fens

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2009
Title :	Irish Red List No. 1 - Water beetles
Author :	Foster, G.N.; Nelson, B.H.; O Connor, Á.
Series :	Ireland Red List No. 1
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2013
Title :	Conservation status assessments for three fen habitat types - 7230, 7210 and 7140
Author :	Kimberley, S.
Series :	Unpublished report to NPWS
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS

Other References

Year :	2004
Title :	Common Standards Monitoring guidance for lowland wetland habitats
Author :	JNCC
Series :	Joint Nature Conservation Committee, Peterborough
Year :	2011
Title :	Review and revision of empirical critical loads and dose-response relationships. Proceedings of an expert workshop, Noordwijkerhout, 23-25 June 2010
Author :	Bobbink, R.; Hettelingh, J.P.
Series :	RIVM report 680359002, Coordination Centre for Effects, National Institute for Public Health and the Environment (RIVM)

Conservation Objectives for : Askeaton Fen Complex SAC [002279]

7210 Calcareous fens with Cladium mariscus and species of the Caricion davallianae*

To maintain the favourable conservation condition of Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae* in Askeaton Fen Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae* has not been mapped in detail for Askeaton Fen SAC and thus the total area of the qualifying priority habitat in the SAC is unknown. *Cladium* fen occurs in various forms and is the most common fen type in the SAC; relatively extensive areas of the habitat occur throughout all the sections of the SAC. The habitat is associated with wet conditions and can be found growing on a marl base, such as at Feereagh and Mornane Loughs and in the fen in the townland of Mornane. In slightly drier conditions, it can be found in association with common reed (*Phragmites australis*), such as at Deegerty, Blind Lough and Dromlohan. The habitat also occurs in mosaic with small areas of alkaline fen (7230) vegetation on peaty substrate. At some edges of the habitat, a gradation to wet marsh can occur, which in turn grades into wet grassland (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See the notes for Habitat area above
Ecosystem function: peat formation	Percentage cover of peat-forming vegetation and water table levels	Maintain active peat formation, where appropriate	In order for peat to form, water levels need to be slightly below or above the soil surface for c.90% of the time
Ecosystem function: hydrology - groundwater levels	Water levels (centimetres); duration of levels; hydraulic gradients	Maintain, or where necessary restore, appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat	Fen habitats require high groundwater levels (i.e. water levels at or above the ground surface) for a large proportion of the calendar year (i.e. duration of mean groundwater level). Fen groundwater levels are controlled by regional groundwater levels in the contributing catchment area (which sustain the hydraulic gradients of the fen groundwater table). Regional abstraction of groundwater may affect fen groundwater levels
Ecosystem function: hydrology - surface water flow	Drain density and form	Maintain, or where necessary restore, as close as possible to natural or semi-natural drainage conditions	Drainage, either within or surrounding the fen habitat, can result in the drawdown of the fen groundwater table. The depth, geometry and density of drainage (hydromorphology) will indicate the scale and impact on fen hydrology. Drainage can result in loss of characteristic species and transition to drier habitats. Drainage has occurred in the past in some parts of Askeaton Fen Complex SAC and poses a threat to the habitat in the SAC (NPWS internal files)
Ecosystem function: water quality	Water chemistry measures	Maintain appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitat	Fens receive natural levels of nutrients (e.g. iron, magnesium and calcium) from water sources. However, they are generally poor in nitrogen and phosphorus, with the latter tending to be the limiting nutrient under natural conditions. Water supply should also be relatively calcium-rich

Vegetation composition: typical species	Percentage cover at a representative number of 2m x 2m monitoring stops	Maintain adequate cover of typical species, including brown mosses and vascular plants	For lists of typical plant species, see the Article 17 conservation status assessment for *Cladium* fens (NPWS, 2013) and the Article 17 fen habitats supporting document (Kimberley, 2013). In this SAC, species occurring with great fen-sedge (*Cladium mariscus*) in the habitat include common reed (*Phragmites australis*), pondweeds (*Potamogeton* spp.), marsh horsetail (*Equisetum palustre*), water horsetail (*E. fluviatile*), lesser water-parsnip (*Berula erecta*), lesser marshwort (*Apium inundatum*), water mint (*Mentha aquatica*) and, particularly where marl is present, bottle sedge (*Carex rostrata*) (NPWS internal files)
Vegetation composition: native negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of native negative indicator species at insignificant levels	Negative indicators include species not characteristic of the habitat and species indicative of undesirable impacts such as overgrazing, undergrazing, nutrient enrichment, agricultural improvement or impacts on hydrology. See JNCC (2004) and Kimberley (2013)
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Non-native species can be invasive and have deleterious effects on native vegetation. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances
Vegetation composition: trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014). Scrub and trees will tend to invade if fen conditions become drier
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground not more than 10%. Where tufa is present, disturbed bare ground not more than 1%	Attribute and target based on Perrin et al. (2014). While grazing may be appropriate in this habitat, excessive areas of disturbed bare ground may develop due to unsuitable grazing regimes. Disturbance can include hoof marks, wallows, human footprints, vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion for peatlands
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes	This includes species on the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The habitat in the SAC contains the only known population of the Critically Endangered water beetle *Hygrotus decoratus* and also the Near Threatened *Hydroporus scalesianus* (Foster et al., 2009), a water beetle indicative of undisturbed fens (NPWS internal files)

Conservation Objectives for : Askeaton Fen Complex SAC [002279]

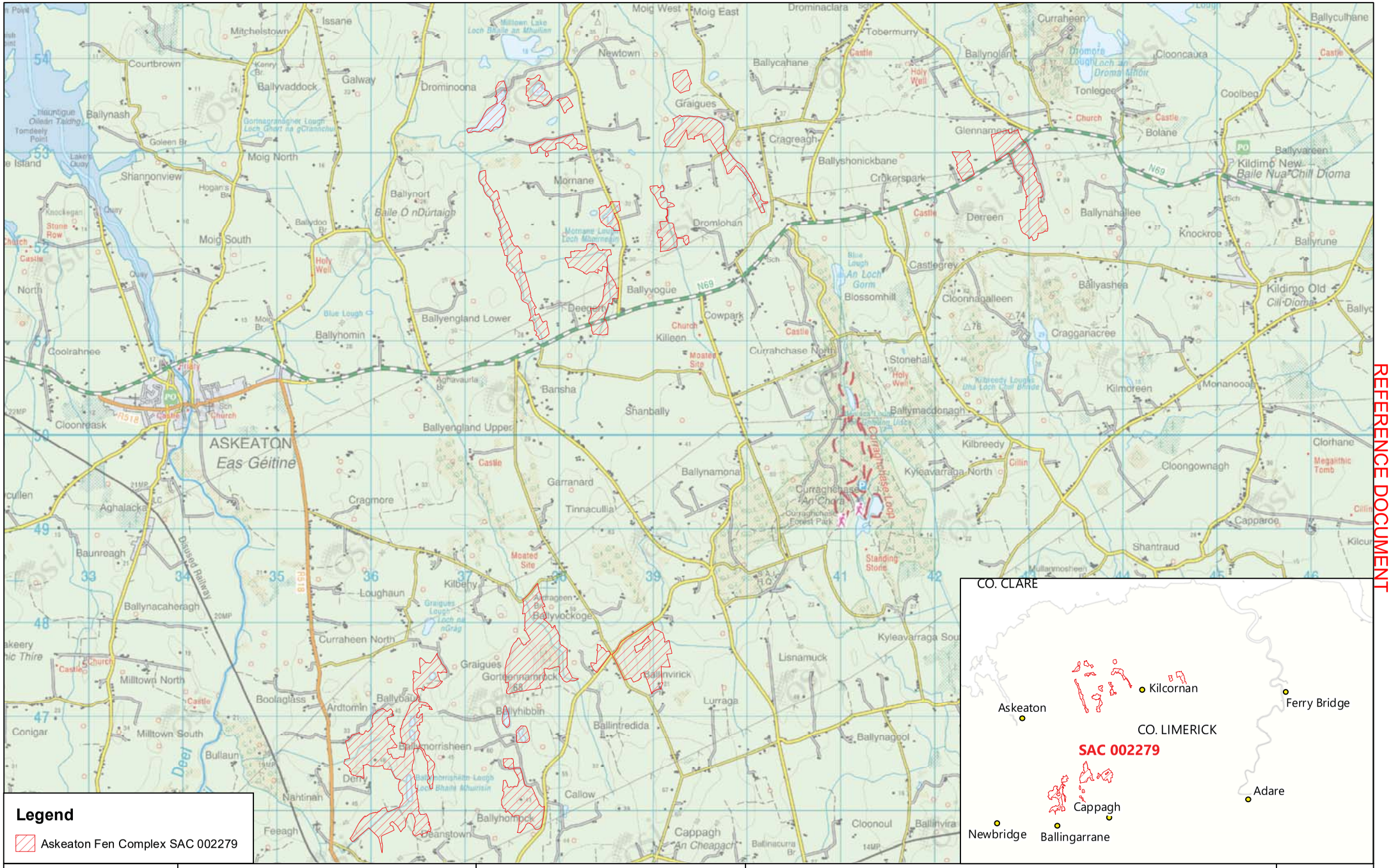
7230 Alkaline fens

To maintain the favourable conservation condition of Alkaline fens in Askeaton Fen Complex SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Alkaline fen has not been mapped in detail for Askeaton Fen Complex SAC and thus the total area of the qualifying habitat in the SAC is unknown. The habitat is generally confined to the margins and seepage zones of fen areas and exhibits a wide range of variation in terms of species composition, species dominance and structure depending on hydrology, substrate and degree of interference. The habitat is particularly well-represented at Graigues, Moig West and north-west of Ballyvogue. Small areas of the habitat are found throughout all the sections of the SAC, but it is not as extensive as *Cladium* fen habitat (7210) with which it occurs in association in places. The habitat also grades into marsh and wet grassland in some areas (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See the notes for Habitat area above
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil pH and nutrient status within natural ranges	Relevant nutrients and their natural ranges are yet to be defined. However, nitrogen deposition is noted as being relevant to this habitat in NPWS (2013). See also Bobbink and Hettelingh (2011)
Ecosystem function: peat formation	Percentage cover of peat-forming vegetation and water table levels	Maintain active peat formation, where appropriate	In order for peat to form, water levels need to be slightly below or above the soil surface for c.90% of the time
Ecosystem function: hydrology - groundwater levels	Water levels (centimetres); duration of levels; hydraulic gradients	Maintain, or where necessary restore, appropriate natural hydrological regimes necessary to support the natural structure and functioning of the habitat	Fen habitats require high groundwater levels (i.e. water levels at or above the ground surface) for a large proportion of the calendar year (i.e. duration of mean groundwater level). Fen groundwater levels are controlled by regional groundwater levels in the contributing catchment area (which sustain the hydraulic gradients of the fen groundwater table). Regional abstraction of groundwater may affect fen groundwater levels
Ecosystem function: hydrology - surface water flow	Drain density and form	Maintain, or where necessary restore, as close as possible to natural or semi-natural drainage conditions	Drainage, either within or surrounding the fen habitat, can result in the drawdown of the alkaline fen groundwater table. The depth, geometry and density of drainage (hydromorphology) will indicate the scale and impact on fen hydrology. Drainage can result in loss of characteristic species and transition to drier habitats. Drainage has occurred in the past in some parts of Askeaton Fen Complex SAC and poses a threat to the habitat in the SAC (NPWS internal files)
Ecosystem function: water quality	Water chemistry measures	Maintain appropriate water quality, particularly pH and nutrient levels, to support the natural structure and functioning of the habitat	Fens receive natural levels of nutrients (e.g. iron, magnesium and calcium) from water sources. However, they are generally poor in nitrogen and phosphorus, with the latter tending to be the limiting nutrient under natural conditions. Water supply should also be relatively calcium-rich
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The entire diversity of alkaline fen vegetation communities within this SAC is unknown. Information on the vegetation communities associated with alkaline fens in the uplands is presented in Perrin et al. (2014)

Vegetation composition: brown mosses	Percentage cover at a representative number of 2m x 2m monitoring stops	Maintain adequate cover of typical brown moss species	Typical brown moss species include *Bryum pseudotriquetrum, Calliergonella cuspidata, Calliergon giganteum, Campylium stellatum, Cratoneuron filicinum, Ctenidium molluscum, Fissidens adianthoides, Palustriella commutata, Scorpidium cossonii, S. revolvens* and *S. scorpioides*. In this SAC, there is an abundance of brown mosses in the habitat, including *Campylium stellatum, Calliergonella cuspidata, Ctenidium molluscum, Fissidens adianthoides* and *Bryum pseudotriquetrum* (NPWS internal files)
Vegetation composition: typical vascular plants	Percentage cover at a representative number of 2m x 2m monitoring stops	Maintain adequate cover of typical vascular plant species	For lists of typical plant species, see the Article 17 conservation status assessment for alkaline fens (NPWS, 2013) and the fen habitats supporting document (Kimberley, 2013). See also Perrin et al. (2014) and JNCC (2004). Species occurring with black bog-rush (*Schoenus nigricans*) in the habitat in the SAC include purple moor-grass (*Molinia caerulea*), long-stalked yellow-sedge (*Carex lepidocarpa*), carnation sedge (*C. panicea*) and other sedges, and rushes (*Juncus* spp.) (NPWS internal files)
Vegetation composition: native negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of native negative indicator species at insignificant levels	Negative indicators include species not characteristic of the habitat and species indicative of undesirable impacts such as overgrazing, undergrazing, nutrient enrichment, agricultural improvement or impacts on hydrology. Native negative indicators may include graminoids such as reed canary-grass (*Phalaris arundinacea*) and reed sweet-grass (*Glyceria maxima*), tall herbs such as great willowherb (*Epilobium hirsutum*), bracken (*Pteridium aquilinum*), bramble (*Rubus fruticosus*) and common nettle (*Urtica dioica*), and bryophytes such as *Brachythecium rutabulum* and *Kindbergia praelonga*
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Non-native species can be invasive and have deleterious effects on native vegetation. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014). Scrub and trees will tend to invade if fen conditions become drier
Vegetation composition: soft rush and common reed cover	Percentage cover in local vicinity of a representative number of monitoring stops	Total cover of soft rush (*Juncus effusus*) and common reed (*Phragmites australis*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: litter	Percentage cover in local vicinity of a representative number of monitoring stops	Total cover of litter not more than 25%	Attribute and target based on JNCC (2004). More than 25% litter cover may indicate insufficient removal of biomass by grazing and/or undesirable water table levels
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground not more than 10%	Attribute and target based on Perrin et al. (2014). While grazing may be appropriate in this habitat, excessive areas of disturbed bare ground may develop due to unsuitable grazing regimes. Disturbance can include hoof marks, wallows, human footprints, vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion for peatlands
Physical structure: tufa formations	Percentage cover in local vicinity of a representative number of monitoring stops	Disturbed proportion of vegetation cover where tufa is present is less than 1%	Attribute and target based on Perrin et al. (2014)

Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes	This includes species on the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)



Legend

Askeaton Fen Complex SAC 002279

An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

MAP 1:
ASKEATON FEN COMPLEX SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002279; version 3. CO. LIMERICK

0 0.4 0.8 1.2 1.6 2 Kilometers

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059216. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

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Map Version 1
Date: Aug 2017

REFERENCE DOCUMENT

Conservation objectives for Barrigone SAC [000432]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	Description
5130	*Juniperus communis* formations on heaths or calcareous grasslands
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
8240	Limestone pavements*

* denotes a priority habitat

Code	Common Name	Scientific Name
1065	Marsh Fritillary	*Euphydryas aurinia*

Citation: *NPWS (2018) Conservation objectives for Barrigone SAC [000432]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for Bolingbrook Hill SAC [002124]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	Description
4010	Northern Atlantic wet heaths with *Erica tetralix*
4030	European dry heaths
6230	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)*

* denotes a priority habitat

Citation: *NPWS (2018) Conservation objectives for Bolingbrook Hill SAC [002124]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

REFERENCE DOCUMENT

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Clare Glen SAC 000930

An Roinn
Cultúir, Oidhreachta agus Gaeltachta

Department of
Culture, Heritage and the Gaeltacht

National Parks and Wildlife Service,
Department of Culture, Heritage and the Gaeltacht,

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E-mail: nature.conservation@chg.gov.ie

Citation:

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Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

000930	Clare Glen SAC
1421	Killarney Fern *Trichomanes speciosum*
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

Please note that this SAC is adjacent to Lower River Shannon SAC (002165) and Slieve Felim to Silvermines Mountains SPA (004165). See map 2. The conservation objectives for this site should be used in conjunction with those for the adjacent sites as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1971
Title :	A Report of Areas of Scientific Interest in County Limerick
Author :	Young, R.
Series :	Unpublished report
Year :	2008
Title :	National survey of native woodlands 2003-2008
Author :	Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A.
Series :	Unpublished report to NPWS
Year :	2010
Title :	A provisional inventory of ancient and long-established woodland in Ireland
Author :	Perrin, P.M.; Daly, O.H.
Series :	Irish Wildlife Manual No. 46
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 3. Species assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2015
Title :	Monitoring methods for the Killarney fern (*Trichomanes speciosum* Willd.) in Ireland
Author :	Ní Dhúill, E.; Smyth, N.; Waldren, S.; Lynn, D.
Series :	Irish Wildlife Manual No. 82
Year :	undated
Title :	A Preliminary Report on Areas of Scientific Interest in County Tipperary (N.R.)
Author :	Fahy, E.
Series :	Unpublished Report

Other References

Year :	2002
Title :	Reversing the habitat fragmentation of British woodlands
Author :	Peterken, G.
Series :	WWF-UK, London
Year :	2012
Title :	Rare and threatened bryophytes of Ireland
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	National Museums Northern Ireland

Spatial data sources

Year :	Revision 2010
Title :	National Survey of Native Woodlands 2003-2008. Version 1
GIS Operations :	QI selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91A0 (map 3)

Conservation Objectives for : Clare Glen SAC [000930]

91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles

To restore the favourable conservation condition of Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles in Clare Glen SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	The woodland in Clare Glen SAC occurs along the Clare River valley and is of mixed composition with native broadleaves and non-native conifers and beech (*Fagus sylvatica*). As part of the National Survey of Native Woodlands (NSNW), the sub-site Clare Glen (NSNW site code 1286) was surveyed by Perrin et al. (2008). The minimum area of old oak woodland in the SAC is estimated to be 17.93ha. Map 3 shows the surveyed woodland classified as 91A0 (17.93ha) by Perrin et al. (2008) in the SAC
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 3 for surveyed area	Distribution based on Perrin et al. (2008)
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The target areas for individual woodlands aim to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). In some cases, topographical constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008) and NPWS internal files
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008) and NPWS internal files
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Sessile oak (*Quercus petraea*) generally regenerates poorly. In suitable sites, ash (*Fraxinus excelsior*) can regenerate in large numbers although few seedlings reach pole size
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources

Woodland structure: indicators of local disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands (Perrin and Daly, 2010), archaeological and geological features as well as red-data and other rare or localised species. Clare Glen (NSNW site code 1286) has been classified as possible ancient woodland by Perrin and Daly (2010). The Near Threatened liverworts *Dumortiera hirsuta* and *Lejeunea eckloniana* (Lockhart et al., 2012) are associated with wet rocks in the river, shaded by the woodland in the SAC (NPWS internal files). The rare Myxomycete fungi *Fuligo muscorum, Stemonitopsis hyperopta* and *Licea testudinacea* are present in the woodland and the Annex II listed Killarney fern (*Trichomanes speciosum*) has also been recorded (NPWS internal files). See also the conservation objective for Killarney fern (1421) in this volume
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008) and NPWS internal files
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including sessile oak (*Quercus petraea*) and birch (*Betula pubescens*)	Species reported in Perrin et al. (2008) and NPWS internal files. See also Young (1971) and Fahy (undated)
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The following are the most common non-native invasive species in this woodland type: beech (*Fagus sylvatica*), sycamore (*Acer pseudoplatanus*) and rhododendron (*Rhododendron ponticum*). Parts of Clare Glen have been planted with conifers (*Abies*, *Picea* and *Pinus* spp.). Beech, rhododendron and cherry laurel (*Prunus laurocerasus*) also occur in the woodland in the SAC (Perrin et al., 2008; NPWS internal files)

REFERENCE DOCUMENT

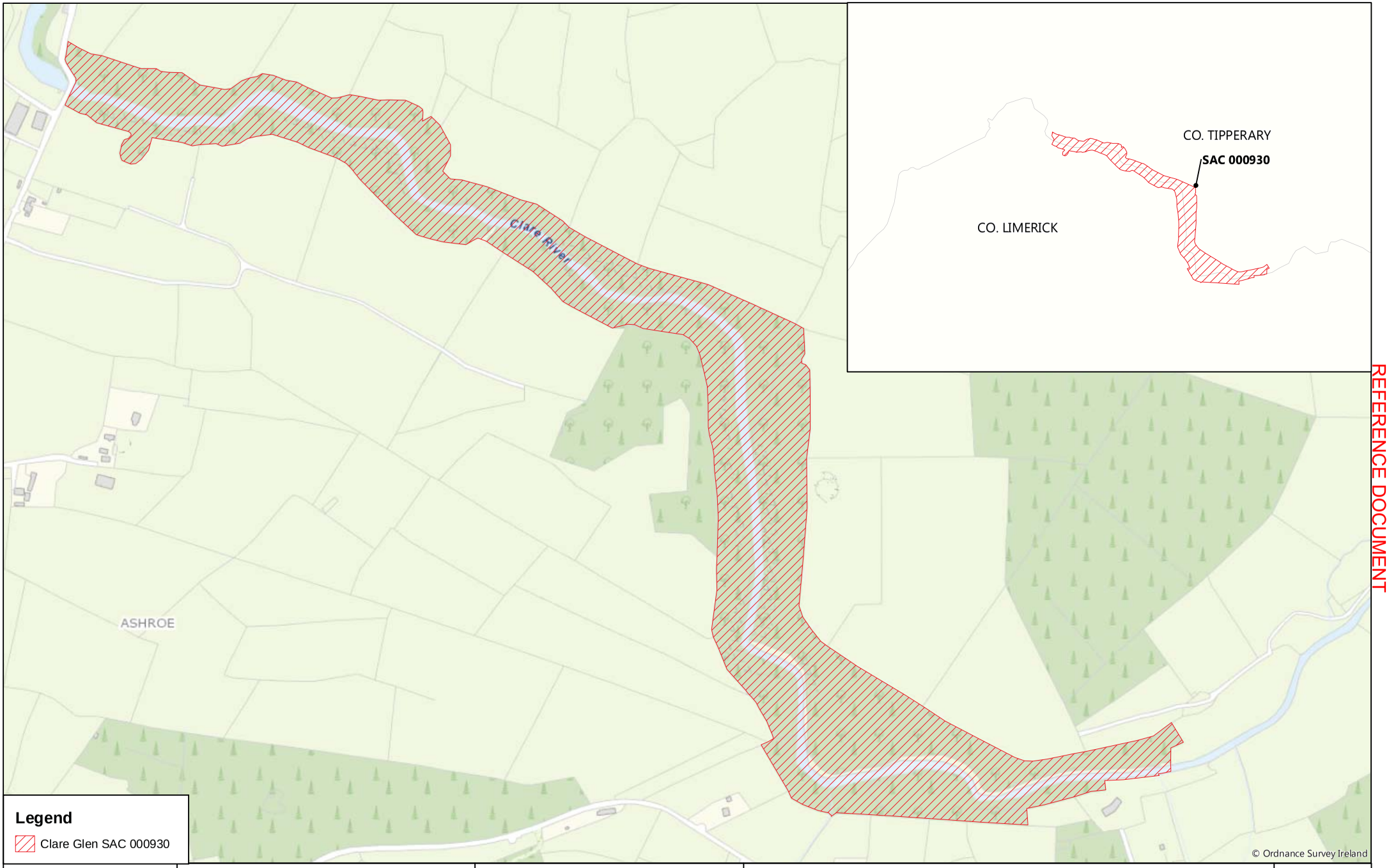
Conservation Objectives for : Clare Glen SAC [000930]

1421 Killarney Fern *Trichomanes speciosum*

To maintain the favourable conservation condition of Killarney Fern in Clare Glen SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	No loss in geographical spread of populations, subject to natural processes	The population of Killarney fern (*Trichomanes speciosum*) is currently known from several locations in Clare Glen SAC, all within hectad R75. Exact locations are not mapped here on account of the threat posed by illegal collecting. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Number of populations	Number	No decline, subject to natural processes	One population of the species has been recorded in the SAC since 1960. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Number of colonies	Number	No decline, subject to natural processes	Eleven colonies of the species have been recorded from the population in the SAC since 1960. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population: life-cycle stage	Type (sporophyte or gametophyte)	Maintain life-cycle stage composition of populations, subject to natural processes	Three of the eleven colonies recorded since 1960 are composed of sporophytes (frond stage), all of which have co-existing gametophytes (filamentous stage), and eight are composed of gametophytes only. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population size: area of occupancy	Square metres	No decline, subject to natural processes	Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population size: living sporophyte fronds	Number	No decline, subject to natural processes	Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population structure: young and unfurling fronds	Occurrence	Young (not fully expanded) and/or unfurling (crozier) fronds present in populations previously observed to have these, subject to natural processes	Young and/or unfurling fronds have been recorded from Clare Glen SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population structure: fertile fronds	Occurrence	Fertile fronds present in populations previously observed to have these, subject to natural processes	Fertile fronds have been recorded from the SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population structure: juvenile sporophyte fronds emerging from gametophytes	Number	No decline, subject to natural processes	Juvenile sporophyte fronds emerging from gametophytes have been recorded from the SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Habitat extent	Hectares	No loss of suitable habitat, subject to natural processes	The species grows in deeply shaded, humid situations - dripping caves, overhangs and crevices on cliffs, rocky slopes, by waterfalls, in stream ravines and gullies, on rock or soil banks in woodlands and, occasionally, under fallen trees and on the floor of damp woodlands. Whilst also occurring in these habitats, the gametophyte stage can grow in drier areas that do not suit the sporophyte. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Hydrological conditions: wet/damp microhabitats	Occurrence	Maintain hydrological conditions at the locations of known populations - visible water source, with dripping or seeping water present and/or substrate wet/damp to touch, subject to natural processes	Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files

Hydrological conditions: relative humidity	Percentage	Maintain relative humidity levels at known colonies at not less than 80%, subject to natural processes	Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Hydrological conditions: desiccated fronds	Number	No increase, subject to natural processes	Presence of desiccated sporophyte fronds and gametophyte mats is indicative of unsuitable conditions. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Light levels: shading	Shade index score	At least 4 for woodland sporophyte-only and mixed colonies; at least 5 for open upland sporophyte-only and mixed colonies; at least 6 for gametophyte-only colonies, subject to natural processes	Shade Index: 4. Moderate shade, e.g. light-medium deciduous canopy with sun flecks. 5. Permanently shaded from direct sunlight but otherwise open to sky. 6. Deep woodland (e.g. coniferous or in ravine) shade, no sun flecks. 7. Perpetual deep shade, e.g. cave entrance, beneath boulder. The species occurs in moderate to deep shade in woodland in Clare Glen SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Woodland canopy cover	Percentage	No loss of woodland canopy at, or in the vicinity of, the locations of known populations and canopy cover here maintained at more than 33%, subject to natural processes	Woodland management at or near to locations of known populations of the species must take account of its habitat requirements, particularly with regard to maintenance of sufficient canopy cover. The species occurs in woodland in Clare Glen SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Invasive species	Occurrence	Maintain absence of invasive non-native and vigorous native plant species at the locations of known populations or, if present, maintain vegetation cover of these at less than 10%, taking into account the habitat requirements of *T. speciosum*	In order to avoid negative impacts on the Killarney fern (*Trichomanes speciosum*), its habitat requirements (site hydrology, relative humidity, canopy cover, shading levels, etc.) must be taken into account in locations that are subject to or proposed for management actions to control invasive non-native and/or vigorous native plant species. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files



REFERENCE DOCUMENT

An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

MAP 1:
CLARE GLEN SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000930; version 3.01.
CO. TIPPERARY / CO. LIMERICK

0 70 140 210 280 Meters

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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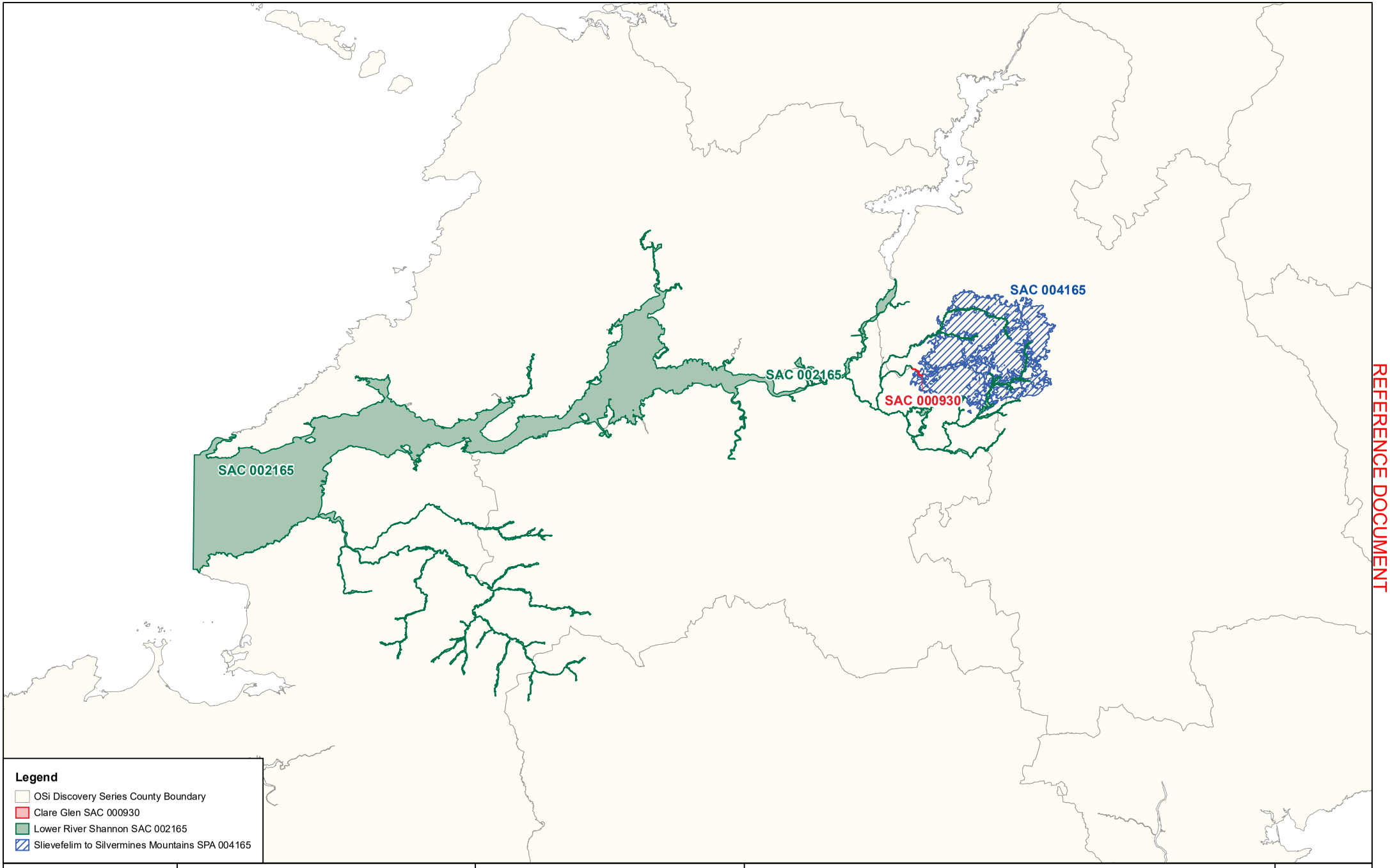
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059216. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

N

Map Version 1
Date: Nov 2017



Legend

- OSi Discovery Series County Boundary
- Clare Glen SAC 000930
- Lower River Shannon SAC 002165
- Slievefelim to Silvermines Mountains SPA 004165

An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

MAP 2:
CLARE GLEN SAC
CONSERVATION OBJECTIVES ADJACENT ADJOINING AND OVERLAPPING DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 000930; version 3.01.
SAC 002165; version 3.02. SPA 004165; version 3.
CO. TIPPERARY / CO. LIMERICK

0 6.5 13 19.5 26 Kilometers

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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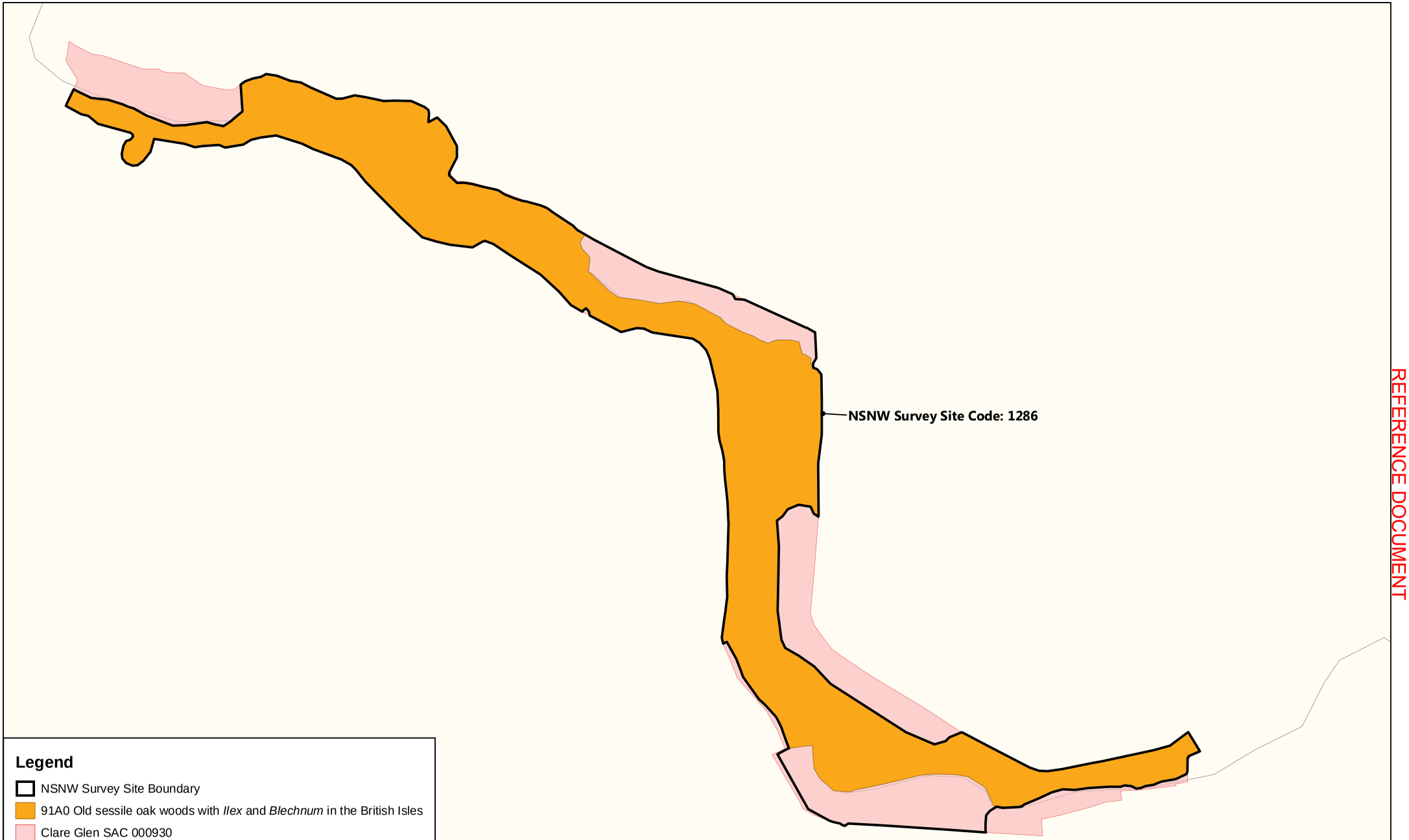
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059216. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

N

Map Version 1
Date: Nov 2017

REFERENCE DOCUMENT



REFERENCE DOCUMENT

Legend

- NSNW Survey Site Boundary
- 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- Clare Glen SAC 000930
- OSi Discovery Series County Boundaries

An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

MAP 3:
CLARE GLEN SAC
CONSERVATION OBJECTIVES
WOODLAND HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 000930; version 3.01.
CO. TIPPERARY / CO. LIMERICK

0 60 120 180 240 Meters

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
Ordnance Survey of Ireland Licence No EN 0059216. © Ordnance Survey of Ireland Government of Ireland

Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059216. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

N

Map Version 1
Date: Nov 2017

Conservation objectives for Curraghchase Woods SAC [000174]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

The favourable conservation status of a species is achieved when:

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- 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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	Description
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)*
91J0	*Taxus baccata* woods of the British Isles*

* denotes a priority habitat

Code	Common Name	Scientific Name
1303	Lesser Horseshoe Bat	*Rhinolophus hipposideros*

Citation: *NPWS (2018) Conservation objectives for Curraghchase Woods SAC [000174]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for Glenomra Wood SAC [001013]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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- 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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	**Description**
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles

* denotes a priority habitat

Citation: *NPWS (2018) Conservation objectives for Glenomra Wood SAC [001013]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

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National Parks and Wildlife Service

Conservation Objectives Series

Glenstal Wood SAC 001432

An Roinn
Cultúir, Oidhreachta agus Gaeltachta

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Culture, Heritage and the Gaeltacht

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90 King Street North, Dublin 7, D07 N7CV, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@chg.gov.ie

Citation:

NPWS (2018) Conservation Objectives: Glenstal Wood SAC 001432. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

001432	Glenstal Wood SAC
1421	Killarney Fern *Trichomanes speciosum*

Please note that this SAC is adjacent to Slievefelim to Silvermines Mountains SPA (004165). See map 2. The conservation objectives for this site should be used in conjunction with those for the adjacent site as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 3. Species assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2015
Title :	Monitoring methods for the Killarney fern (*Trichomanes speciosum* Willd.) in Ireland
Author :	Ní Dhúill, E.; Smyth, N.; Waldren, S.; Lynn, D.
Series :	Irish Wildlife Manual No. 82

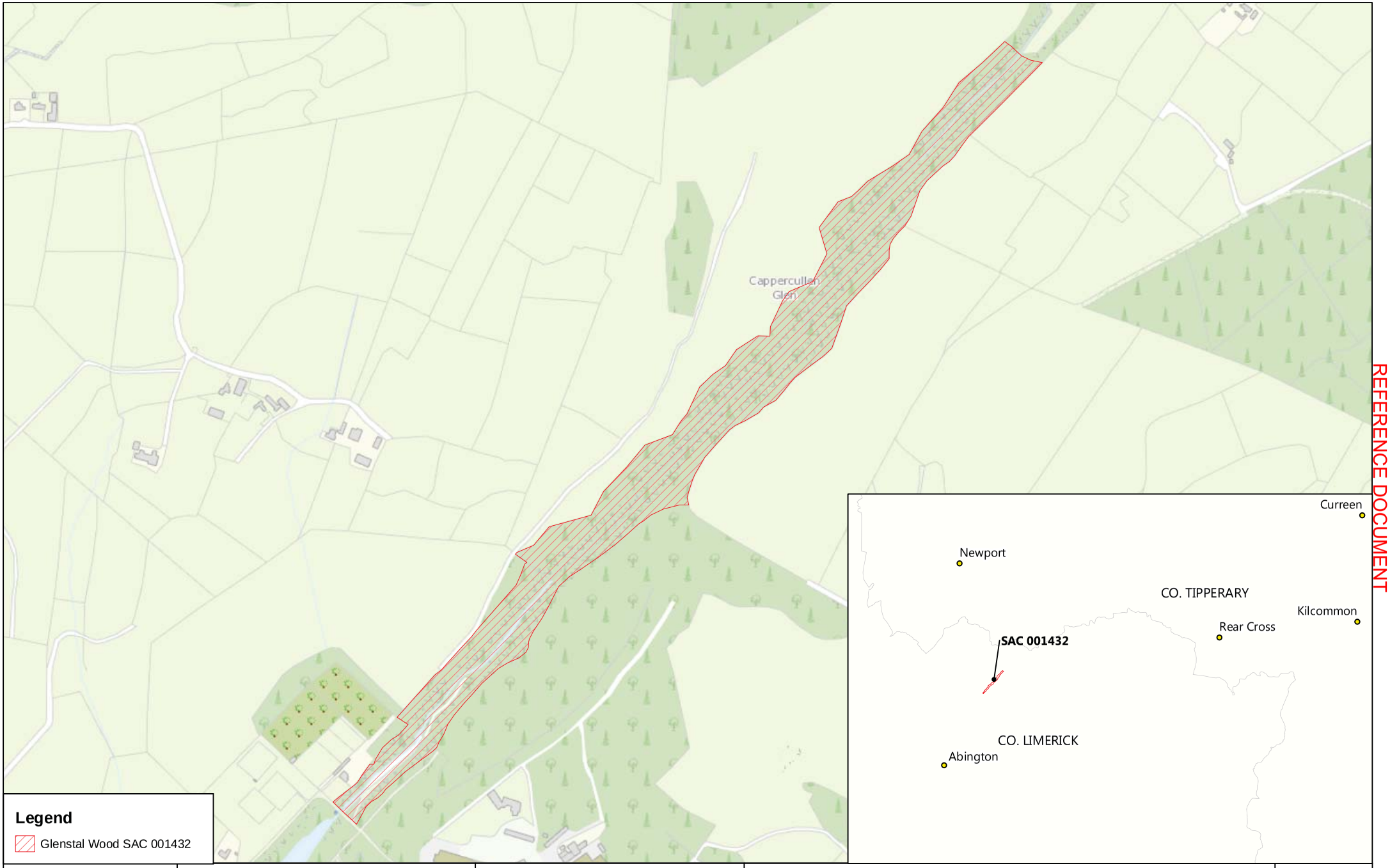
Conservation Objectives for : Glenstal Wood SAC [001432]

1421 Killarney Fern *Trichomanes speciosum*

To maintain the favourable conservation condition of Killarney Fern in Glenstal Wood SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	No loss in geographical spread of populations, subject to natural processes	The population of Killarney fern (*Trichomanes speciosum*) is currently known from several locations in Glenstal Wood SAC, all within hectad R75. Exact locations are not mapped here on account of the threat posed by illegal collecting. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Number of populations	Number	No decline, subject to natural processes	One population of the species has been recorded in the SAC since 1960. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Number of colonies	Number	No decline, subject to natural processes	Eight colonies of the species have been recorded from the population in the SAC since 1960, seven of which were noted in 2016. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population: life-cycle stage	Type (sporophyte or gametophyte)	Maintain life-cycle stage composition of populations, subject to natural processes	Five of the eight colonies recorded since 1960 are composed of sporophytes (frond stage), of which four have co-existing gametophytes (filamentous stage), and three are composed of gametophytes only. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population size: area of occupancy	Square metres	No decline, subject to natural processes	Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population size: living sporophyte fronds	Number	No decline, subject to natural processes	Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population structure: young and unfurling fronds	Occurrence	Young (not fully expanded) and/or unfurling (crozier) fronds present in populations previously observed to have these, subject to natural processes	Young and/or unfurling fronds have been recorded from Glenstal Wood SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population structure: fertile fronds	Occurrence	Fertile fronds present in populations previously observed to have these, subject to natural processes	Fertile fronds have been recorded from the SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Population structure: juvenile sporophyte fronds emerging from gametophytes	Number	No decline, subject to natural processes	Juvenile sporophyte fronds emerging from gametophytes have not been recorded from the SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Habitat extent	Hectares	No loss of suitable habitat, subject to natural processes	The species grows in deeply shaded, humid situations - dripping caves, overhangs and crevices on cliffs, rocky slopes, by waterfalls, in stream ravines and gullies, on rock or soil banks in woodlands and, occasionally, under fallen trees and on the floor of damp woodlands. Whilst also occurring in these habitats, the gametophyte stage can grow in drier areas that do not suit the sporophyte. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Hydrological conditions: wet/damp microhabitats	Occurrence	Maintain hydrological conditions at the locations of known populations - visible water source, with dripping or seeping water present and/or substrate wet/damp to touch, subject to natural processes	Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files

Hydrological conditions: relative humidity	Percentage	Maintain relative humidity levels at known colonies at not less than 80%, subject to natural processes	Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Hydrological conditions: desiccated fronds	Number	No increase, subject to natural processes	Presence of desiccated sporophyte fronds and gametophyte mats is indicative of unsuitable conditions. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Light levels: shading	Shade index score	At least 4 for woodland sporophyte-only and mixed colonies; at least 5 for open upland sporophyte-only and mixed colonies; at least 6 for gametophyte-only colonies, subject to natural processes	Shade Index: 4. Moderate shade, e.g. light-medium deciduous canopy with sun flecks. 5. Permanently shaded from direct sunlight but otherwise open to sky. 6. Deep woodland (e.g. coniferous or in ravine) shade, no sun flecks. 7. Perpetual deep shade, e.g. cave entrance, beneath boulder. The species occurs in moderate to deep shade in woodland in Glenstal Wood SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Woodland canopy cover	Percentage	No loss of woodland canopy at, or in the vicinity of, the locations of known populations and canopy cover here maintained at more than 33%, subject to natural processes	Woodland management at or near to locations of known populations of the species must take account of its habitat requirements, particularly with regard to maintenance of sufficient canopy cover. The species occurs in woodland in Glenstal Wood SAC. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files
Invasive species	Occurrence	Maintain absence of invasive non-native and vigorous native plant species at the locations of known populations or, if present, maintain vegetation cover of these at less than 10%, taking into account the habitat requirements of *T. speciosum*	In order to avoid negative impacts on the Killarney fern (*Trichomanes speciosum*), its habitat requirements (site hydrology, relative humidity, canopy cover, shading levels, etc.) must be taken into account in locations that are subject to or proposed for management actions to control invasive non-native and/or vigorous native plant species. Based on Ní Dhúill et al. (2015), NPWS (2013) and NPWS internal files



Legend

Glenstal Wood SAC 001432

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Department of Culture, Heritage and the Gaeltacht

MAP 1:
GLENSTAL WOOD SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001432; version 3. CO. LIMERICK

0 50 100 150 200 250 Meters

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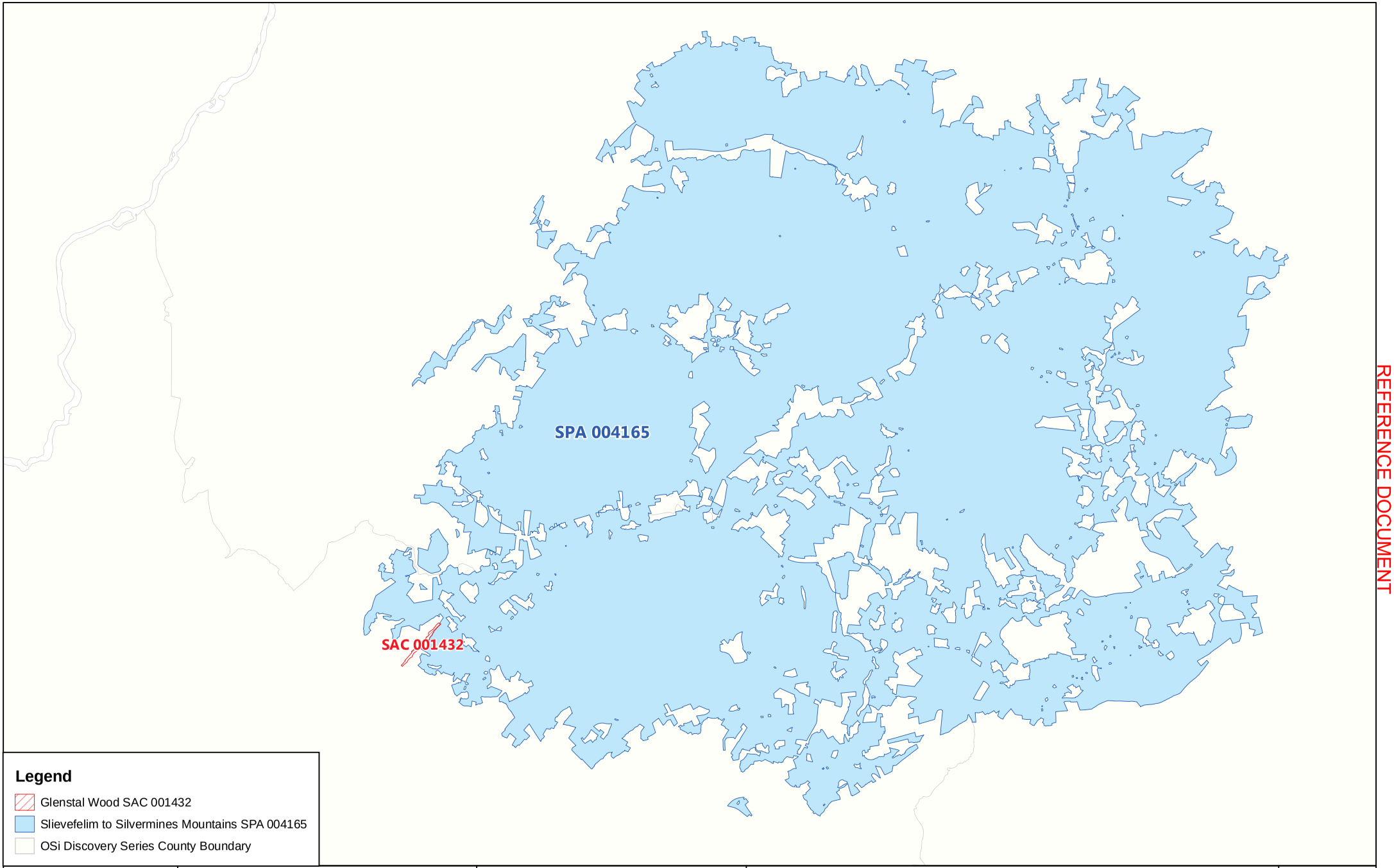
Map Version 1
Date: Nov 2017

REFERENCE DOCUMENT



Legend

- Glenstal Wood SAC 001432
- Slievefelim to Silvermines Mountains SPA 004165
- OSi Discovery Series County Boundary

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MAP 2:
GLENSTAL WOOD SAC
CONSERVATION OBJECTIVES
OVERLAPPING DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001432; version 3. SPA 004165; version 3.
CO. LIMERICK, CO. TIPPERARY

0 1 2 3 4 Kilometers

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Map Version 1
Date: Nov 2017

REFERENCE DOCUMENT

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Keeper Hill SAC 001197

An Roinn
Cultúir, Oidhreachta agus Gaeltachta

Department of
Culture, Heritage and the Gaeltacht

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Department of Culture, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

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Series Editor: Rebecca Jeffrey

ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

001197	Keeper Hill SAC
4010	Northern Atlantic wet heaths with *Erica tetralix*
7130	Blanket bogs (* if active bog)

Please note that this SAC overlaps with Slievefelim to Silvermines Mountains SPA (004165). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2005
Title :	Conservation Plan for 2005-2010. Keeper Hill cSAC Site Code 001197 Co. Tipperary
Author :	NPWS
Series :	Conservation Plan
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	Keeper Hill SAC (1197) Conservation objectives supporting document- blanket bogs and associated habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Conservation Objectives for : Keeper Hill SAC [001197]

4010 Northern Atlantic wet heaths with Erica tetralix

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Keeper Hill SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Northern Atlantic wet heaths with *Erica tetralix* has not been mapped in detail for this SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 126ha, covering 31% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Keeper Hill SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Wet heath is documented to occur throughout the SAC, often occurring in a mosaic with blanket bog, dry heath and upland grassland (NPWS, 2005; NPWS internal files). Further information can be found within NPWS (2005), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	Wet heath vegetation communities have been recorded in this SAC (NPWS internal files), one of which corresponds to a community recorded in the National Survey of Upland Habitats and listed in the provisional list of vegetation communities described in Perrin et al. (2014). Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: cross-leaved heath	Occurrence within 20m of a representative number of monitoring stops	Cross-leaved heath (*Erica tetralix*) present within a 20m radius of each monitoring stop	Attribute and target based on Perrin et al. (2014)
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: ericoid species and crowberry	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrubs less than 75%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014)

Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)

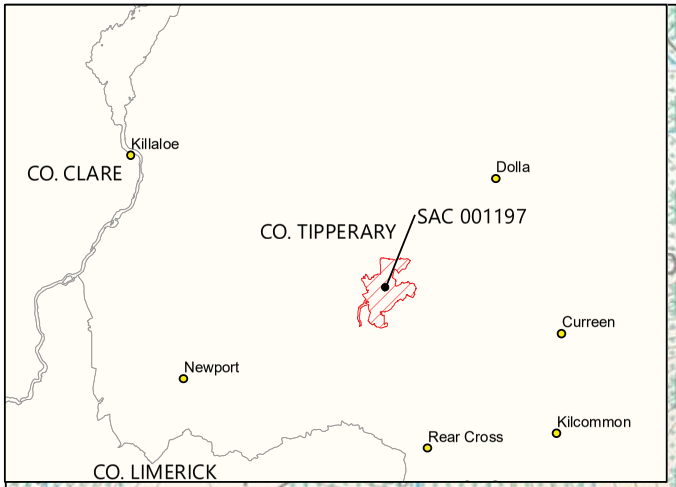
Conservation Objectives for : Keeper Hill SAC [001197]

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs (* if active bog) in Keeper Hill SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Blanket bog has not been mapped in detail for Keeper Hill SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 126ha, covering 31% of the SAC (NPWS internal files). Further details on this and the following attributes can be found in the Keeper Hill SAC conservation objectives supporting document for blanket bogs and associated habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Blanket bog is documented to occur in a mosaic with wet heath in the SAC. It is most common on the higher slopes including the upper ridge (NPWS, 2005; NPWS internal files). Further information can be found within NPWS (2005), NPWS internal files and the blanket bogs and associated habitats supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: peat formation	Active blanket bog as a proportion of the total area of Annex I blanket bog habitat	At least 99% of the total Annex I blanket bog area is active	See the blanket bogs and associated habitats supporting document for further details
Ecosystem function: hydrology	Flow direction, water levels, occurrence of drains and erosion gullies	Natural hydrology unaffected by drains and erosion	Further details and a brief discussion of restoration potential is presented in the blanket bogs and associated habitats supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The diversity of blanket bog vegetation communities in this SAC is unknown. Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least seven	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species less than 75%	Attribute and target based on Perrin et al. (2014). See the blanket bogs and associated habitats supporting document for the list of potential dominant species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014)
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014)

Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014)
Physical structure: erosion	Percentage area in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Attribute and target based on Perrin et al. (2014)
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). The Near Threatened moss *Sphagnum russowii* (Lockhart et al., 2012) occurs in blanket bog in the SAC (NPWS, 2005)



Middlequarter
Ballynanoose
Bauraglanna
Coumaniller
Coumbeg
Eagles' Nest
Coumnogh
Slievekimalta
694
or
Keeper Hill
Sliabh Coimeálta
Stone Circle
Glas an Ghleanna Stream
Lacka
Ballyhourigan Walk
Slieve Felim Way
Boolatin
Bunkimalta
Ford
Tooratanggart
68
67
66
65
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Legend

Keeper Hill SAC 001197

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Department of Culture, Heritage and the Gaeltacht

MAP 1:
KEEPER HILL SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001197; version 3.
CO. TIPPERARY

0 0.25 0.5 0.75 1 km

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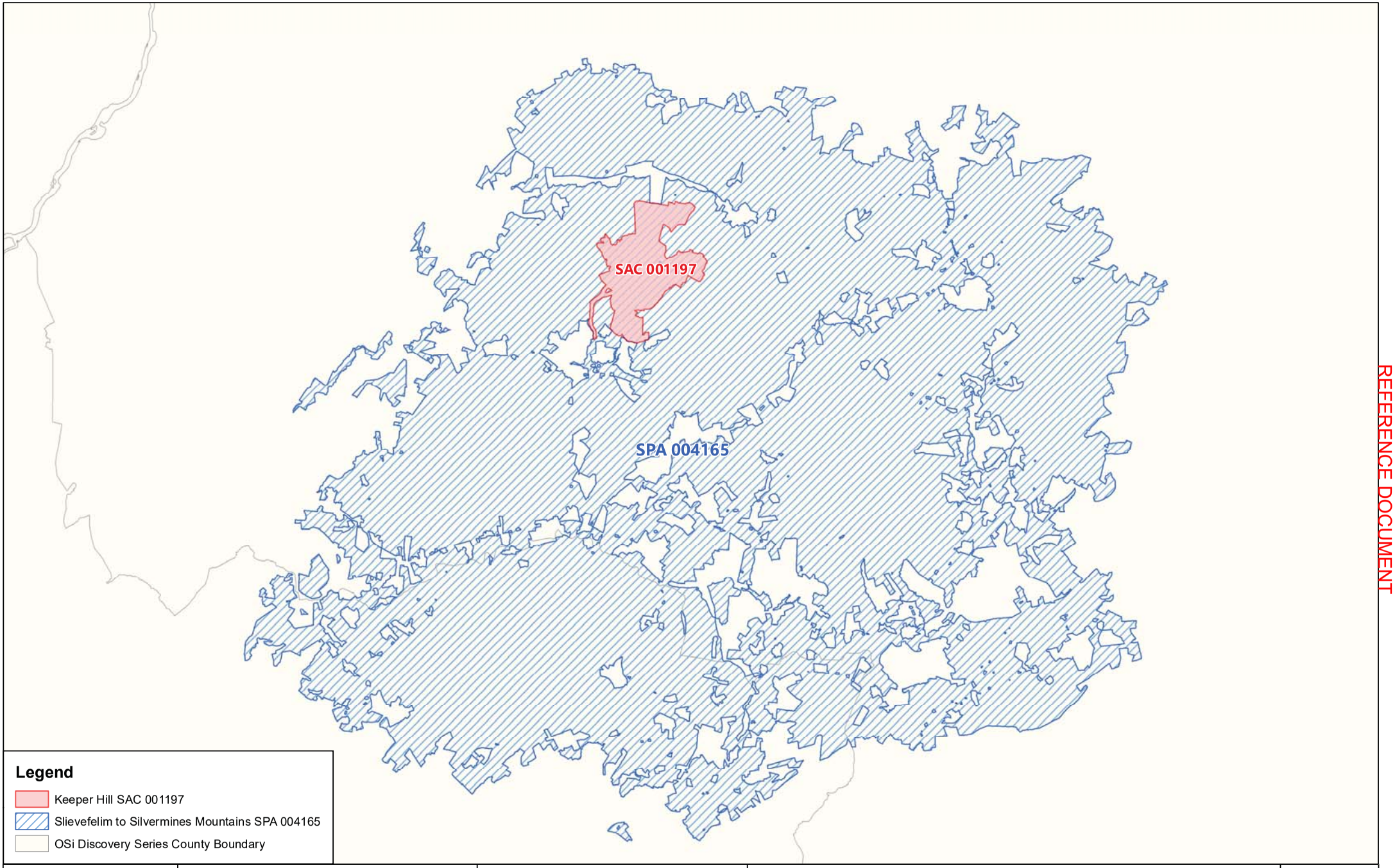
Map Version 1
Date: Aug 2017

REFERENCE DOCUMENT



Legend

- Keeper Hill SAC 001197
- Slievefelim to Silvermines Mountains SPA 004165
- OSi Discovery Series County Boundary

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Department of Culture, Heritage and the Gaeltacht

MAP 2:
KEEPER HILL SAC
CONSERVATION OBJECTIVES
OVERLAPPING DESIGNATION
Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001197; version 3. SPA 004165; version 3.
CO. TIPPERARY

0 1 2 3 4 5 km

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Map Version 1
Date: Aug 2017

REFERENCE DOCUMENT

Conservation objectives for Kilduff, Devilsbit Mountain SAC [000934]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	Description
4030	European dry heaths
6230	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)*

* denotes a priority habitat

Citation: *NPWS (2018) Conservation objectives for Kilduff, Devilsbit Mountain SAC [000934]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for Lough Derg, North-east Shore SAC [002241]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	Description
5130	*Juniperus communis* formations on heaths or calcareous grasslands
7210	Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae*
7230	Alkaline fens
8240	Limestone pavements*
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)*
91J0	*Taxus baccata* woods of the British Isles*

* denotes a priority habitat

Citation: *NPWS (2018) Conservation objectives for Lough Derg, North-east Shore SAC [002241]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for Lough Derg (Shannon) SPA [004058]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	Common Name	Scientific Name
A017	Cormorant	*Phalacrocorax carbo*
A061	Tufted Duck	*Aythya fuligula*
A067	Goldeneye	*Bucephala clangula*
A193	Common Tern	*Sterna hirundo*

To acknowledge the importance of Ireland's wetlands to wintering waterbirds, “Wetland and Waterbirds” may be included as a Special Conservation Interest for some SPAs that have been

designated for wintering waterbirds and that contain a wetland site of significant importance to one or more of the species of Special Conservation Interest. Thus, a second objective is included as follows:

Objective: To maintain or restore the favourable conservation condition of the wetland habitat at Lough Derg (Shannon) SPA as a resource for the regularly-occurring migratory waterbirds that utilise it.

Citation: *NPWS (2018) Conservation objectives for Lough Derg (Shannon) SPA [004058]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

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National Parks and Wildlife Service

Conservation Objectives Series

Lower River Shannon SAC 002165

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

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Citation:
NPWS (2012) Conservation Objectives: Lower River Shannon SAC 002165. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002165 Lower River Shannon SAC

1029	Freshwater Pearl Mussel *Margaritifera margaritifera*
1095	Sea Lamprey *Petromyzon marinus*
1096	Brook Lamprey *Lampetra planeri*
1099	River Lamprey *Lampetra fluviatilis*
1106	Atlantic Salmon *Salmo salar* (only in fresh water)
1110	Sandbanks which are slightly covered by sea water all the time
1130	Estuaries
1140	Mudflats and sandflats not covered by seawater at low tide
1150	*Coastal lagoons
1160	Large shallow inlets and bays
1170	Reefs
1220	Perennial vegetation of stony banks
1230	Vegetated sea cliffs of the Atlantic and Baltic coasts
1310	*Salicornia* and other annuals colonizing mud and sand
1330	Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
1349	Bottlenose Dolphin *Tursiops truncatus*
1355	Otter *Lutra lutra*
1410	Mediterranean salt meadows (*Juncetalia maritimi*)
3260	Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation
6410	*Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)
91E0	*Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion*, *Alnion incanae*, *Salicion albae*)

Please note that this SAC overlaps with River Shannon and River Fergus Estuaries SPA (004077), Loop Head SPA (004119), Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161), Slievefelim to Silvermines Mountains SPA (004165) and Kerry Head SPA (004189). It is also adjacent to Clare Glen SAC (00930). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

Title: Aspects of brook lamprey (*Lampetra planeri* Bloch) spawning in Irish waters
Year: in press
Author: Rooney, S.M.; O'Gorman, N.M.; Green, F.; King, J.J.
Series: Biology and Environment

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Coastal lagoons [Version 1]
Year: 2012
Author: NPWS
Series: Unpublished Report to NPWS

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Marine habitats and species [Version 1]
Year: 2012
Author: NPWS
Series: Unpublished Report to NPWS

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Coastal habitats [Version 1]
Year: 2012
Author: NPWS
Series: Unpublished Report to NPWS

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Woodland habitats [Version 1]
Year: 2012
Author: NPWS
Series: Unpublished Report to NPWS

Title: Lower River Shannon SAC (002170): Conservation objectives supporting document - Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation [Version 1]
Year: 2012
Author: NPWS
Series: Unpublished Report to NPWS

Title: Intertidal Hard and Soft Bottom Investigations in Lower River Shannon cSAC (Site Code: IE002165)/Shannon Fergus Estuary SPA (Site Code: IE004077)
Year: 2011c
Author: Aquafact
Series: Unpublished Report to NPWS

Title: Reef Investigations in Lower River Shannon cSAC (cSAC Site Code: IE002165)
Year: 2011b
Author: Aquafact
Series: Unpublished Report to NPWS

Title: Subtidal Benthic Investigations in Lower River Shannon cSAC (cSAC Site Code: IE002165)
Year: 2011a
Author: Aquafact
Series: Unpublished Report to NPWS

Title: National survey and assessment of the conservation status of Irish sea cliffs
Year: 2011
Author: Barron, S.J.; Delaney, A.; Perrin, P.M.; Martin, J.; O'Neill, F.
Series: Irish Wildlife Manuals No. 53

Title: Comparison of field- and GIS-based assessments of barriers to Atlantic salmon migration: a case study in the Nore Catchment, Republic of Ireland
Year: 2011
Author: Gargan, P. G.; Roche, W. K.; Keane, S.; King, J.J.; Cullagh, A.; Mills, P.; O'Keeffe, J.
Series: J. Appl. Ichthyol. 27 (Suppl. 3), 66–72

Title: Fine-scale population genetic structuring of bottlenose dolphins in Irish coastal waters
Year: 2011
Author: Mirimin, L.; Miller, R.; Dillane, E.; Berrow, S.D.; Ingram, S.; Cross, T.F.; Rogan, E.
Series: Animal Conservation 2011: 1–12

Title: The use of Cork Harbour by bottlenose dolphins (*Tursiops truncatus* (Montagu, 1821))
Year: 2011
Author: Ryan, C.; Cross, T.F.; Rogan, E.
Series: Irish Naturalists' Journal 31(1): 1-9

Title: Irish cetacean review (2000-2009)
Year: 2010
Author: Berrow, S.D.; Whooley, P.; O'Connell, M.; Wall, D.
Series: Irish Whale and Dolphin Group

Title: Bottlenose Dolphin SAC Survey 2010
Year: 2010
Author: Berrow, S.D.; O'Brien, J.; Groth, L.; Foley, A.; Voigt, K.
Series: Unpublished Report to NPWS

Title: Otter tracking study of Roaringwater Bay
Year: 2010
Author: De Jongh, A.; O'Neill, L.
Series: Unpublished Draft Report to NPWS

Title: Second Draft Cloon (Shannon Estuary) Freshwater Pearl Mussel Sub-basin Management Plan (2009-2015)
Year: 2010
Author: DEHLG
Series: Unpublished Report to NPWS

Title: Social structure within the bottlenose dolphin (*Tursiops truncatus*) population in the Shannon Estuary, Ireland

Year: 2010

Author: Foley, A.; McGrath, D.; Berrow, S.D.; Gerritsen, H.

Series: Aquatic Mammals 36(4): 372-381

Title: Irish Semi-natural Grasslands Survey. Annual report no. 3: Counties Donegal, Dublin, Kildare & Sligo

Year: 2010

Author: O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; McNutt, K.E.; Perrin, P.M. ; Delaney, A.

Series: Unpublished Report to NPWS

Title: A provisional inventory of ancient and long-established woodland in Ireland

Year: 2010

Author: Perrin, P.M.; Daly, O.H.

Series: Irish Wildlife Manuals No. 46

Title: Monitoring and Assessment of Irish Lagoons for the purpose of the EU Water Framework Directive

Year: 2010

Author: Roden, C.M,; Oliver, G.

Series: EPA

Title: Report of the standing scientific committee to the DCENR. The status of Irish salmon stocks in 2010 and precautionary catch advice for 2011

Year: 2010

Author: SSC

Series: Unpublished Report to DCENR

Title: The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. [S.I. 296 of 2009]

Year: 2009b

Author: Government of Ireland

Series: Irish Statute Book

Title: The European Communities Environmental Objectives (Surface Water) Regulations 2009. [S.I. 272 of 2009]

Year: 2009a

Author: Government of Ireland

Series: Irish Statute Book

Title: Winter distribution of bottle-nosed dolphins (*Tursiops truncatus* (Montagu)) in the inner Shannon Estuary

Year: 2009

Author: Berrow, S.D.

Series: Irish Naturalists' Journal 30(1): 35-39

Title: Towards a bottlenose dolphin whistle ethogram from the Shannon Estuary, Ireland

Year: 2009

Author: Hickey, R.; Berrow, S.D.; Goold, J.

Series: Biology and Environment: Proceedings of the Royal Irish Academy 109B (2), 89–94

Title: Saltmarsh Monitoring Report 2007-2008

Year: 2009

Author: McCorry, M.; Ryle, T.

Series: Unpublished Report to NPWS

Title: Cetaceans in Irish waters: A review of recent research

Year: 2009

Author: O'Brien, J.; Berrow, S.D.; McGrath, D.; Evans, P.G.H.

Series: Biology and Environment: Proceedings of the Royal Irish Academy 109B (2): 63-88

Title: A note on long-distance matches of bottlenose dolphins (*Tursiops truncatus*) around the Irish coast using photoidentification

Year: 2009

Author: O'Brien, J.; Berrow, S.D.; Ryan, C.; McGrath, D.; O'Connor, I.; Pesante, G.; Burrows, G.; Massett, N.; Klotzer, V.; Whooley, P.

Series: Journal Cetacean Res. Mgmt. 11: 69–74

Title: An updated population status report for bottlenose dolphins using the Lower River Shannon SAC in 2008

Year: 2008

Author: Englund, A.; Ingram, S.; Rogan, E.

Series: Unpublished Report to NPWS

Title: National Survey of Native Woodlands 2003-2008

Year: 2008

Author: Perrin, P.; Martin, J.; Barron, S.; O'Neill, F.; McNutt, K.; Delaney, A.

Series: Unpublished Report to NPWS

Title: Rapid Assessment of *Margaritifera margaritifera* (L.) populations in Ireland: Rivers assessed in 2007

Year: 2008

Author: Ross, E.D.

Series: Unpublished Report to NPWS

Title: Marine surveys of two Irish sandbank cSACs

Year: 2007

Author: Aquafact

Series: Unpublished Report to NPWS

Title: Population status report for bottlenose dolphins using the Lower River Shannon SAC, 2006-2007

Year: 2007

Author: Englund, A.; Ingram, S.; Rogan, E.

Series: Unpublished Report to NPWS

Title: Evolutionary history of lamprey paired species *Lampetra fluviatilis* (L.) and *Lampetra planeri* (Bloch) as inferred from mitochondrial DNA variation

Year: 2007

Author: Espanhol, R.; Almeida, P.R.; Alves, M.J.

Series: Molecular Ecology 16, 1909-1924

Title: Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents, Article 17 forms and supporting maps

Year: 2007

Author: NPWS

Series: Unpublished Report to NPWS

Title: A Survey of Juvenile Lamprey Populations in the Corrib and Suir Catchments

Year: 2007

Author: O'Connor, W.

Series: Irish Wildlife Manuals No. 26

Title: Inventory of Irish coastal lagoons

Year: 2007

Author: Oliver, G.

Series: Unpublished Report to NPWS

Title: Using T-PODs to investigate the echolocation of coastal bottlenose dolphins

Year: 2007

Author: Philpott, E.; Englund, A.; Ingram, S.; Rogan, E.

Series: Journal of Marine Biological Association, UK. 87: 11-17

Title: Otter Survey of Ireland 2004/2005

Year: 2006

Author: Bailey, M.; Rochford, J.

Series: Irish Wildlife Manuals No. 23

Title: Whistle Production by Bottlenose Dolphins *Tursiops truncatus* in the Shannon Estuary

Year: 2006

Author: Berrow, S.D.; O'Brien, J.; Holmes, B.

Series: Irish Naturalists' Journal. 28(5): 208-213

Title: The status of host fish populations and fish species richness in European freshwater pearl mussel (*Margaritifera margaritifera*) streams

Year: 2006

Author: Geist, J.; Porkka, M.; Kuehn, R.

Series: Aquatic Conservation: Marine and Freshwater Ecosystems 16, 251–266

Title: Otters - ecology, behaviour and conservation

Year: 2006

Author: Kruuk, H.

Series: Oxford University Press

Title: A survey of rare and scarce vascular plants in County Limerick

Year: 2006

Author: Reynolds, S.; Conaghan, J.; Fuller, J.

Series: Unpublished Report to NPWS

Title:	National Inventory of sea cliffs and coastal heaths
Year:	2005
Author:	Browne, A.
Series:	Unpublished Report to NPWS
Title:	Developing sustainable whalewatching in the Shannon estuary
Year:	2003
Author:	Berrow, S.D.
Series:	p198-203; In Marine Ecotourism: Issues and Experiences. Garrod, B and Wilson. J. (Eds.) Channel View Publications
Title:	Identifying lamprey. A field key for sea, river and brook lamprey
Year:	2003
Author:	Gardiner, R.
Series:	Conserving Natura 2000 rivers, Conservation techniques No. 4. English Nature, Peterborough
Title:	Monitoring the river, sea and brook lamprey, *Lampetra fluviatilis*, *L. planeri* and *Petromyzon marinus*
Year:	2003
Author:	Harvey, J.; Cowx, I.
Series:	Conserving Natura 2000 Rivers Monitoring Series No. 5. English Nature, Peterborough
Title:	Bottlenose dolphins (*Tursiops truncatus*) in the Shannon Estuary and selected areas of the west-coast of Ireland
Year:	2003
Author:	Ingram, S.; Rogan, E.
Series:	Unpublished Report to NPWS
Title:	The ecology of seabirds and marine mammals in a fluctuating marine environment
Year:	2003
Author:	Rogan, E.; Kelly, T.; Ingram, S.; Roycroft, D.
Series:	Unpublished Report to Higher Education Authority of Ireland
Title:	Irish Whale and Dolphin Group cetacean sighting review (1991-2001)
Year:	2002
Author:	Berrow, S.D.; Whooley, P.; Ferriss, S.
Series:	Irish Whale and Dolphin Group
Title:	Organochlorine concentrations in resident bottlenose dolphins (*Tursiops truncatus*) in the Shannon estuary, Ireland
Year:	2002
Author:	Berrow, S.D.; McHugh, B.; Glynn, D.; McGovern, E.; Parsons, K.; Baird, R.W.; Hooker, S.D.
Series:	Marine Pollution Bulletin 44: 1296-1313
Title:	Identifying critical areas and habitat preferences of bottlenose dolphins (*Tursiops truncatus*)
Year:	2002
Author:	Ingram, S.; Rogan, E.
Series:	Marine Ecology Progress Series 244: 247-255

Title: Reversing the habitat fragmentation of British woodlands
Year: 2002
Author: Peterken, G.
Series: WWF-UK, London

Title: An extensive survey of bottlenose dolphins (*Tursiops truncatus*) on the west coast of Ireland
Year: 2001
Author: Ingram, S.; Englund, A.; Rogan, E.
Series: Unpublished Report to the Heritage Council

Title: The ecology and conservation of bottlenose dolphins in the Shannon Estuary, Ireland
Year: 2000
Author: Ingram, S.
Series: Unpublished PhD thesis, University College Cork

Title: A survey of bottlenose dolphins (*Tursiops truncatus*) in the Shannon Estuary
Year: 2000
Author: Rogan, E.; Ingram, S.; Holmes, B.; O'Flanagan, C.
Series: Marine Institute Marine Resource Series No. 9

Title: Tour boats and dolphins: A note on quantifying the activities of whale watching boats in the Shannon estuary, Ireland
Year: 1999
Author: Berrow, S.D.; Holmes, B.
Series: Journal of Cetacean Research and Management 1(2): 199-200

Title: Diet of Otters *Lutra lutra* on Inishmore, Aran Islands, west coast of Ireland
Year: 1999
Author: Kingston, S.; O'Connell, M.; Fairley, J.S.
Series: Biol & Environ Proc R Ir Acad B 99B:173–182

Title: National Shingle Beach Survey of Ireland 1999
Year: 1999
Author: Moore, D.; Wilson, F.
Series: Unpublished Report to NPWS

Title: The saltmarshes of Ireland: an inventory and account of their geographical variation
Year: 1998
Author: Curtis, T.G.F.; Sheehy-Skeffington, M.J.
Series: Biology and Environment, Proceedings of the Royal Irish Academy 98B: 87-104

Title: A survey of intertidal sediment biotopes in estuaries in Ireland
Year: 1997
Author: Falvey, J.P.; Costello, M.J.; Dempsey, S.
Series: Unpublished Report

Title:	Distribution and Abundance of Bottle-nosed Dolphins *Tursiops truncatus* (Montagu) in the Shannon Estuary, Ireland
Year:	1996
Author:	Berrow, S.D.; Holmes, B.; Kiely, O.
Series:	Biology and Environment: Proceedings of the Royal Irish Academy 96B (1), 1-9
Title:	The spatial organization of otters (*Lutra lutra*) in Shetland
Year:	1991
Author:	Kruuk, H.; Moorhouse, A.
Series:	J. Zool, 224: 41-57
Title:	Otter survey of Ireland
Year:	1982
Author:	Chapman, P.J.; Chapman, L.L.
Series:	Unpublished Report to Vincent Wildlife Trust

Spatial data sources

Year:	Interpolated 2012
Title:	Sandbank Survey 2007
GIS operations:	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1110 (map 3)
Year:	Interpolated 2012
Title:	Sandbank survey 2007; subtidal benthic survey 2010; reef survey 2010; intertidal hard and soft bottom survey 2010
GIS operations:	Polygon feature classes from marine community types base data sub-divided based on interpolation of marine survey data. Expert opinion used as necessary to resolve any issues arising
Used for:	Marine community types, 1110, 1140, 1170 (maps 3, 5, 8, 9)
Year:	2010
Title:	EPA WFD transitional waterbody data
GIS operations:	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1130 (map 4)
Year:	Revision 2011
Title:	Inventory of Irish Coastal Lagoons. Version 3
GIS operations:	Clipped to SAC boundary
Used for:	1150 (map 6)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High Water Mark (HWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. EPA WFD transitional waterbody data erased from extent. Expert opinion used as necessary to resolve any issues arising
Used for:	1160 (map 7)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	High water mark (HWM) and low water mark (LWM) polyline feature classes converted into polygon feature classes and combined; EU Annex I Saltmarsh and Coastal data erased out if present
Used for:	Marine community types base data (map 9)
Year:	Revision 2012
Title:	National Shingle Beach Survey
GIS operations:	Clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1220 (map 10)
Year:	2011
Title:	National Survey and assessment of the conservation status of Irish sea cliffs
GIS operations:	Clipped to SAC boundary
Used for:	1230 (map 11)

Year:	Revision 2010
Title:	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary; overlapping regions with Coastal CO data investigated and resolved with expert opinion used
Used for:	1310, 1330, 1410 (map 12)
Year:	Derived 2012
Title:	Internal NPWS files
GIS operations:	Dataset created from spatial references supplied by NPWS experts. Expert opinion used as necessary to resolve any issues arising
Used for:	3260 (map 13)
Year:	Revision 2010
Title:	National Survey of Native Woodlands 2003-2008. Version 1
GIS operations:	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	91E0 (map 14)
Year:	2012
Title:	NPWS rare and threatened species database
GIS operations:	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used for:	1029 (map 15)
Year:	Revision 2012
Title:	Margaritifera Sensitive Areas data
GIS operations:	Relevant catchment boundaries identified. Expert opinion used as necessary to resolve any issues arising
Used for:	1029 (map 15)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	Low Water Mark (LWM) polyline feature class converted into polygon feature class; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1349 (map 16)
Year:	2005
Title:	OSi Discovery series vector data
GIS operations:	Creation of an 80m buffer on the marine side of the high water mark (HWM); creation of a 10m buffer on the terrestrial side of the HWM; combination of 80m and 10m HWM buffer datasets; creation of a 10m buffer on the terrestrial side of the river banks data; creation of 20m buffer applied to canal centreline data. These datasets are combined with the derived EPA WFD Waterbodies data and Coastal Lagoon data for the 1355 CO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising. Creation of 250m buffer on marine side of HWM to highlight potential commuting points
Used for:	1355 (map 17)

Year:	2010
Title:	EPA WFD Waterbodies data
GIS operations:	Creation of a 20m buffer applied to river and stream centreline data; creation of 80m buffer on the aquatic side of lake data; creation of 10m buffer on the terrestrial side of lake data. These datasets are combined with the derived OSi data and Coastal Lagoon data for the 1355 CO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1355 (no map)

Year:	Revision 2011
Title:	Inventory of Irish Coastal Lagoons. Version 3
GIS operations:	Creation of 80m buffer on the aquatic side of lagoon data; creation of 10m buffer on the terrestrial side of lagoon data. These datasets are combined with the derived OSi data and EPA WFD Waterbodies data for the 1355 CO. Overlapping regions are investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used for:	1355 (no map)

Conservation objectives for: Lower River Shannon SAC [002165]

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	Maintain at 7km. See map 15	This conservation objective applies to the freshwater pearl mussel population in the Cloon River, Co. Clare only (see also the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 (Government of Ireland, 2009b)). The Cloon population is confined to the main channel and is distributed from Croany Bridge to approx. 1.5km upstream of Clonderalaw Bridge (Ross, 2008; DEHLG, 2010)
Population size	Number of adult mussels	Restore to 10,000 adult mussels	The Cloon population was estimated as less than 10,000 in 2009 (DEHLG, 2010)
Population structure: recruitment	Percentage per size class	Restore to least 20% of population no more than 65mm in length; and at least 5% of population no more than 30mm in length	Mussels of no more than 65mm are considered 'young mussels' and may be found buried in the substratum and/or beneath adult mussels. Mussels of no more than 30mm are 'juvenile mussels' and are always buried in the substratum. No juvenile or young mussels were found in the Cloon in 2007, with the smallest mussel measuring 80.3mm (Ross, 2008). A single 'young mussel' measuring 61.3mm was recorded in 2009 (DEHLG, 2010)
Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses. The Cloon failed the target for dead shells in 2009, with 31% dead shells across the single transect counted. There were no previous data on the number of live adults (DEHLG, 2010)

REFERENCE DOCUMENT

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat extent	Kilometres	Restore suitable habitat in more than 3.3km (see map 15) and any additional stretches necessary for salmonid spawning	The species' habitat covers stretches of a short coastal river; and is a combination of 1) the area of habitat adult and juvenile mussels can occupy and 2) the area of spawning and nursery habitats the host fish can occupy. Fish nursery habitat typically overlaps with mussel habitat. Fish spawning habitat is generally adjacent to mussel habitat, but may lie upstream of the generalised mussel distribution. Only those salmonid spawning areas that could regularly contribute juvenile fish to the areas occupied by adult mussels should be considered. The availability of mussel habitat and fish spawning and nursery habitats are determined by flow and substratum conditions. The habitat for the species is currently unsuitable for the survival of adult mussels or the recruitment of juveniles (DEHLG, 2010). The target is based on the stretches of river identified, from a combination of dedicated survey and incidental records, as having habitat for the species
Water quality: macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality-macroinvertebrates: EQR greater than 0.90; phytobenthos: EQR greater than 0.93	These EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). The habitat in the Cloon failed both standards during 2009 sampling for the Sub-basin Management Plans (DEHLG, 2010). See also The European Communities Environmental Objectives (Surface Water) Regulations 2009 (Government of Ireland, 2009a)
Substratum quality: filamentous algae (macroalgae), macrophytes (rooted higher plants)	Percentage	Restore substratum quality-filamentous algae: absent or trace (<5%); macrophytes: absent or trace (<5%)	The habitat in the Cloon failed both standards during 2009 sampling for the Sub-basin Management Plans, with cover abundance values of up to 50% recorded for filmentous algae and 80% for macrophytes (DEHLG, 2010). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrata

REFERENCE DOCUMENT

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Substratum quality: sediment	Occurrence	Restore substratum quality- stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The habitat for the species is currently unsuitable for the recruitment of juveniles owing to sedimentation of the substratum. In many locations, it is also unsuitable for the survival of adult mussels (DEHLG, 2010). Significant sedimentation has been recorded during all recent mussel monitoring surveys (Ross, 2008; DEHLG, 2010). Recruitment of juvenile mussels is being prevented by the poor quality of the river substrate
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. Redox potential measurements in 2009 yielded losses of 32.3 - 43.5% (average of 39%) at 5cm depth (DEHLG, 2010)
Hydrological regime: flow variability	Metres per second	Restore appropriate hydrological regimes	The availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other important factor). In order to restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum, 2) low flows do not exacerbate the deposition of fines and 3) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle

REFERENCE DOCUMENT

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval form of the freshwater pearl mussel and, thus, they are essential to the completion of the life cycle. 0+ and 1+ fish are typically used, both because of the habitat overlaps and the development of immunity with age in the fish. Fish presence is considered sufficient, as higher densities and biomass of fish are indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for pearl mussels and a lack of pearl mussel recruitment, while significantly lower densities and biomass of host fish were associated with high numbers of juvenile mussels. Fish movement patterns must be such that 0+ fish in the vicinity of the mussel habitat remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time. The Cloon freshwater pearl mussel population appears to favour native brown trout, with 17.2% of 1+ and older trout caught in 2009 hosting glochidia (DEHLG, 2010). Therefore, it is particularly important that trout are not out-competed by stocked fish

REFERENCE DOCUMENT

1095 Sea Lamprey *Petromyzon marinus*

To restore the favourable conservation condition of Sea Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas. See Gargan et al. (2011). Specific barriers serve to constrain the up-river migration of sea lamprey. The upper extent of the SAC in the R. Fergus is delineated by a barrier to migration. Barriers are also present in the Mulkear and Feale
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007)
Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003)
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Lampreys spawn in clean gravels. Surveys by Inland Fisheries ireland (IFI) commonly indicated accumulations of redds downstream of major weirs. (See also Gargan et al., 2011)
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Despite observed spawning activity, sampling for ammocoetes consistently fails to find these in many samplling stations and never in any great numbers

REFERENCE DOCUMENT

1096 Brook Lamprey *Lampetra planeri*

To maintain the favourable conservation condition of Brook Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to brook lampreys' migration, both up- and downstream, thereby possibly limiting the species to specific stretches and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	Attribute and target based on data from Harvey and Cowx (2003). It is impossible to distinguish between brook and river lamprey juveniles in the field (Gardiner, 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Spawning site and redd attributes established by IFI (Rooney et al., in press)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date (King et al., unublished data)

1099 River Lamprey *Lampetra fluviatilis*

To maintain the favourable conservation condition of River Lamprey in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	% of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to river lampreys' migration, both up- and downstream, thereby possibly limiting species to specific stretches and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present	Attribute and target based on data from Harvey and Cowx (2003). It is impossible to distinguish between river and brook lamprey juveniles in the field (Gardiner 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of river/brook lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Many sites with suitable larval attributes i.e. fine sediment in low velocity habitat, are found not to contain larval lamprey. This may be a function of chance or probability, or may be a consequence of insufficient recruitment to fill all spatial niches. Occupancy in excess of 50% of sites would be 'reasonable' for the Irish catchments examined to date (King et al., unpublished data)

REFERENCE DOCUMENT

1106 Atlantic Salmon *Salmo salar* (only in fresh water)

To restore the favourable conservation condition of Salmon in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	% of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas. The large hyrdo-electric station at Ardnacrusha and the Parteen regulating weir present considerable obstructions to upstream passage of salmon on the Shannon main channel. While both have fish passes installed, upstream migration of salmon is still problematical. Further weirs upstream on the Shannon also restrict access to spawning habitat. No such obstacles, causing significant fish passage issues for salmon are present on the Feale and Mulkear rivers
Adult spawning fish	Number	Conservation Limit (CL) for each system consistently exceeded	A conservation limit is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee of the National Salmon Commission's annual model output of CL attainment levels. See SSC (2010). Stock estimates are either derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The salmon stocks in the Shannon above the impoundments are significantly below their Conservation Limits. Salmon stocks in the Feale and Mulkear rivers are above CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 min sampling	Target is threshold value for rivers currently exceeding their conservation limit (CL). The abundance of salmon fry at monitored sites on the Shannon main channel, above the hydro-electric station, is significantly below this target
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*). On the Shannon main channel, salmon smolt abundance may be significantly affected by mortality passing through hydro-electric turbines
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels. Artificial barriers are currently preventing salmon from accessing suitable spawning habitat on the Shannon main channel

REFERENCE DOCUMENT

1106 Atlantic Salmon *Salmo salar* (only in fresh water)

To restore the favourable conservation condition of Salmon in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

REFERENCE DOCUMENT

1110 Sandbanks which are slightly covered by sea water all the time

To maintain the favourable conservation condition of Sandbanks which are slightly covered by sea water all the time in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	The distribution of sandbanks is stable, subject to natural processes. See map 3	Distribution established using the Valentia Island to River Shannon Admiralty Chart (no. 1819_0)
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 3	Habitat area was estimated as 1,353ha using the Valentia Island to River Shannon Admiralty Chart (no. 1819_0)
Community distribution	Hectares	Conserve the following community type in a natural condition: Subtidal sand to mixed sediment with *Nephtys* spp. community complex. See map 9	The likely area of the community was derived from a sandbank survey in 2007 (Aquafact, 2007) and a subtidal survey in 2010 (Aquafact, 2011a). See marine supporting document for further details

REFERENCE DOCUMENT

1130 Estuaries

To maintain the favourable conservation condition of Estuaries in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 4	Habitat area was estimated as 24,273ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Estuarine subtidal muddy sand to mixed sediment with gammarids community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys* spp. community complex; Fucoid-dominated intertidal reef community complex; Faunal turf-dominated subtidal reef community; and Anemone-dominated subtidal reef community. See map 9	The likely area of these communities was derived from intertidal and subtidal surveys undertaken in 2010 (Aquafact, 2011a and c). See marine supporting document for further details

REFERENCE DOCUMENT

1140 Mudflats and sandflats not covered by seawater at low tide

To maintain the favourable conservation condition of Mudflats and sandflats not covered by seawater at low tide in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 5	Habitat area was estimated using OSi data as 8,808ha
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community; and Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex. See map 9	The likely area of these communities was derived from an intertidal survey in 2010 (Aquafact, 2011c). See marine supporting document for further details

REFERENCE DOCUMENT

1150 *Coastal lagoons

To restore the favourable conservation condition of Coastal lagoons in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes. Favourable reference area 33.4ha- Shannon Airport Lagoon 24.2ha; Cloonconeen Pool 3.9ha; Scattery Lagoon 2.8ha; Quayfield and Poulaweala Loughs 2.5ha. See map 6	Areas calculated from spatial data derived from Oliver, 2007. Site codes IL031- IL034. See lagoon supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 6	Sites IL031-IL034 in Oliver, 2007. See lagoon supporting document for further details
Salinity regime	practical salinity units (psu)	Median annual salinity and temporal variation within natural ranges	The lagoons in the site vary from oligohaline to euhaline. See lagoon supporting document for further details
Hydrological regime	Metres	Annual water level fluctuations and minima within natural ranges	Lagoons listed for this site are all considered to be shallow. See lagoon supporting document for further details
Barrier: connectivity between lagoon and sea	Permeability	Appropriate hydrological connections between lagoons and sea, including where necessary, appropriate management	The lagoons within this site exhibit a variety of barrier types including cobble/shingle, karst and artificial embankment. See lagoon supporting document for further details
Water quality: chlorophyll a	µg/L	Annual median chlorophyll a within natural ranges and less than 5µg/L	Target based on Roden and Oliver (2010). See lagoon supporting document for further details
Water quality: Molybdate Reactive Phosphorus (MRP)	mg/L	Annual median MRP within natural ranges and less than 0.1mg/L	Target based on Roden and Oliver (2010). See lagoon supporting document for further details
Water quality: Dissolved Inorganic Nitrogen (DIN)	mg/L	Annual median DIN within natural ranges and less than 0.15mg/L	Target based on Roden and Oliver, 2010). See lagoon supporting document for further details
Depth of macrophyte colonisation	Metres	Macrophyte colonisation to maximum depth of lagoons	As these lagoons are all shallow, it is expected the macrophytes should extend to their deepest points. See lagoon supporting document for further details
Typical plant species	number and m^2	Maintain number and extent of listed lagoonal specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoon supporting document for further details
Typical animal species	number	Maintain listed lagoon specialists, subject to natural variation	Species listed in Oliver, 2007. See lagoon supporting document for further details
Negative indicator species	Number and % cover	Negative indicator species absent or under control	Low salinity, shallow water and elevated nutrient levels increase the threat of un-natural encroachment by reedbeds

REFERENCE DOCUMENT

1160 Large shallow inlets and bays

To maintain the favourable conservation condition of Large shallow inlets and bays in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	The permanent habitat area is stable or increasing, subject to natural processes. See map 7	Habitat area was estimated as 35,282ha using OSi data and the Transitional Water Body area as defined under the Water Framework Directive
Community distribution	Hectares	Conserve the following community types in a natural condition: Intertidal sand with *Scolelepis squamata* and *Pontocrates* spp. community; Intertidal sand to mixed sediment with polychaetes, molluscs and crustaceans community complex; Subtidal sand to mixed sediment with *Nucula nucleus* community complex; Subtidal sand to mixed sediment with *Nephtys* spp. community complex; Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and *Laminaria*-dominated community complex. See map 9	The likely area of these communities was derived from intertidal and subtidal surveys in 2010 (Aquafact, 2011a and c). See marine supporting document for further details

REFERENCE DOCUMENT

1170 Reefs

To maintain the favourable conservation condition of Reefs in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat distribution	Occurrence	The distribution of Reefs is stable, subject to natural processes. See map 8	Distribution is established from intertidal and subtidal reef surveys in 2010 (Aquafact, 2011b and c)
Habitat area	Hectares	The permanent habitat area is stable, subject to natural processes. See map 8	Habitat area was estimated as 21,421ha from the 2010 intertidal and subtidal reef survey (Aquafact 2011b and c)
Community distribution	Hectares	Conserve the following reef community types in a natural condition: Fucoid-dominated intertidal reef community complex; Mixed subtidal reef community complex; Faunal turf-dominated subtidal reef community; Anemone-dominated subtidal reef community; and *Laminaria*-dominated community complex. See map 9	Based on the 2010 intertidal and subtidal reef survey (Aquafact, 2011b and c). See marine supporting document for further details

REFERENCE DOCUMENT

1220 Perennial vegetation of stony banks

To maintain the favourable conservation condition of Perennial vegetation of stony banks in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession	Current area unknown. It was recorded to be present but extent was not mapped from nine sub-sites during the National Shingle Beach Survey (Moore and Wilson, 1999): Ross Bay, Kilbaha Bay, Cloonconeen Lough and Rinevella Bay, Carrigholt Bay, Ballymacrinan Bay, Bunaclugga Bay, Corcas and Sandhills, Bromore and Ballybunnion. NB further unsurveyed areas maybe present within the site
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 10 for recorded locations	Full distribution currently unknown. An excellent array of shingle beaches is known to occur, including three that are ranked of high interest (Ross Bay, Bunaclugga Bay and Cloonconeen Lough and Rinevella), the last of which is associated with a lagoonal system (Moore and Wilson, 1999). Habitat likely to be more widespread. See coastal habitats supporting document for further details. See also the conservation objective for coastal lagoons (1150)
Physical structure: functionality and sediment supply	Presence/ absence of physical barriers	Maintain the natural circulation of sediment and organic matter, without any physical obstructions	Based on data from Moore and Wilson (1999). Shingle features are relatively stable in the long-term and shingle beaches within this SAC appear to be functioning naturally with few artifical restrictions to beach dynamics (Moore and Wilson, 1999). See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from Moore and Wilson (1999). Lichens are present at Ross Bay and Cloonconeen and Rinevella Bay indicating a degree of stability. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain the typical vegetated shingle flora including the range of sub-communities within the different zones	The Carrigaholt sub-site is a small site with a diverse flora. The Bunaclugga Bay sub-site supports yellow horned-poppy (*Glaucium flavum*), which contributes to the site's high interest ranking. Based on data from Moore and Wilson (1999). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage cover	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from Moore and Wilson (1999). Negative indicators include non-native species, species indicative of changes in nutrient status and species not considered characteristic of the habitat. See coastal habitats supporting document for further details

REFERENCE DOCUMENT

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat length	Kilometres	Area stable or increasing, subject to natural processes, including erosion. For sub-sites mapped: Kilbaha- 4.1km; Ladder Rock- 1.0km; Moyarta- 0.9km; Lisheencrony- 1.1km; Burrane- 0.2km; Kerry Head- 33.4km; Ballybunion- 15.6km; Kilclogher- 4.9km; Loop Head- 6.1km. See map 11	Based on data from the Irish Sea Cliff Survey (ISCS) (Barron et al., 2011). Nine sub-sites were identified using a combination of aerial photos and the DCENR helicopter viewer. The length of each cliff was measured (in some cases the cliff was measured in sections) to give a total estimated area of 67.3km within the SAC. Cliffs are linear features and are therefore measured in kilometres. Length of cliff likely to be underestimated. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 11	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). Most of the SAC west of Kilcredaun Point and Kilconly Point is bounded by high rocky sea cliffs. Both hard and soft cliffs occur in this SAC (ISCS; Browne, 2005). See coastal habitats supporting document for further details
Physical structure: functionality and hydrological regime	Occurrence of artificial barriers	No alteration to natural functioning of geomorphological and hydrological processes due to artificial structures	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). Maintaining natural geomorphological processes including natural erosion is important for the health of vegetated sea cliff. Hydrological processes maintain flushes and in some cases tufa formations that can be associated with sea cliffs. Freshwater seepage was noted from the cliffs at Loop Head and Kilclogher. Stream or cascade was noted from Kerry Head. Sea coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain range of sea cliff habitat zonations including transitional zones, subject to natural processes including erosion and succession	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). At Loop Head sub-site the zones recorded were: splash, crevice ledge and ungrazed coastal grassland on hard cliffs. At Kerry Head sub-site the zones recorded were: splash, pioneer, crevice ledge, ungrazed/grazed coastal grassland on hard cliffs and coastal grassland on soft cliffs. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details

REFERENCE DOCUMENT

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

To maintain the favourable conservation condition of Vegetated sea cliffs in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in the Irish Sea cliff survey (Barron et al., 2011)	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details
Vegetation composition: negative indicator species	Percentage	Negative indicator species (including non-natives) to represent less than 5% cover	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details
Vegetation composition: bracken and woody species	Percentage	Cover of bracken (*Pteridium aquilinum*) on grassland and/or heath to be less than 10%. Cover of woody species on grassland and/or heath to be less than 20%	Based on data from the Irish Sea Cliff Survey (Barron et al., 2011). See coastal habitats supporting document for further details

REFERENCE DOCUMENT

1310 *Salicornia* and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle - 0.005ha; Inishdea, Owenshere - 0.003ha; Knock - 0.029ha; Querin - 0.185ha; Rinevilla Bay - 0.001ha. See map 12	Based on data from Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Habitat recorded at five of the ten sub-sites surveyed and mapped, giving a total estimated area of 0.223ha. NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 12 for known distribution	Based on data from McCorry and Ryle (2009). Habitat recorded at six out of ten sub-sites by McCorry and Ryle (2009). NB further unsurveyed areas maybe present within the site. *Salicornia* is an annual species, so its distribution can vary significantly from year to year. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Sediment supply is particularly important for this pioneer saltmarsh community, as the distribution of this habitat depends on accretion rates. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). Creeks deliver sediment throughout saltmarsh system. Creeks and pan structures well developed in the larger sections of the marsh at Carrigafoyle, Shepperton/Fergus Estuary and Inishdea/Owenshere. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	This pioneer saltmarsh community requires regular tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009). See coastal habitats supporting document for further details

REFERENCE DOCUMENT

1310 *Salicornia* and other annuals colonizing mud and sand

To maintain the favourable conservation condition of *Salicornia* and other annuals colonizing mud and sand in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation composition: typical species and sub-communities	Percentage cover	Maintain the presence of species-poor communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	Based on data from McCorry and Ryle (2009). Species of local distinctiveness recorded include sea wormwood (*Seriphidium maritimum*), meadow barley (*Hordeum secalinum*) and hard grass (*Parapholis strigosa*) (McCorry and Ryle, 2009; internal NPWS files). See coastal habitats supporting document for further details
Vegetation structure: negative indicator species-*Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry and Ryle (2009). *Spartina* was recorded at all sub-sites and is considered a significant threat to the habitat. See coastal habitats supporting document for further details

REFERENCE DOCUMENT

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 6.774ha; Barrigone, Aughinish- 10.288ha; Beagh- 0.517ha; Bunratty- 26.939ha; Shepperton, Fergus Estuary- 37.925ha; Inishdea, Owenshere- 18.127ha; Killadysert, Inishcorker- 2.604ha; Knock- 0.576ha; Querin- 3.726ha; Rinevilla Bay- 11.883ha. See map 12	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle 2009). Ten sub-sites that supported Atlantic salt meadow were mapped (119.36ha) and additional areas of potential saltmarsh (376.07ha) were identified from an examination of aerial photographs, giving a total estimated area of 495.43ha. Saltmarsh habitat also occurs at 11 other sub-sites within the SAC (Curtis and Sheehy-Skeffington, 1998). NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 12 for mapped distribution	Based on data from McCorry and Ryle (2009). Within the sites surveyed by the SMP, estuary type saltmarsh over a mud substrate is most common and ASM is the dominant saltmarsh habitat. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/ absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). Embankments along much of the shoreline are a feature of this SAC. These embankments were erected in the past and much of the site has been remodelled and large areas of land reclaimed as a result. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). Creeks and pan structures well developed at the larger sections of ASM in the Carrigafoyle sub-site. At the ASM at Shepperton, Fergus Estuary, the larger patches still retain a natural creek and salt pan structure. At Inishdea, Owenshere sub-site within some of the intact saltmarsh, there is a complex network of creeks, salt pans and depressions. At Killadysart, Inishcorker and Querin, creek and pan development is generally poor. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	See coastal habitats supporting document for further details

REFERENCE DOCUMENT

1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

To restore the favourable conservation condition of Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). Zonations to other saltmarsh habitats as well as brackish and terrestrial habitats were recorded at all sub-sites. See coastal habitats supporting document for further details
Vegetation structure: vegetation height	Centimeters	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). All of the sub-sites are grazed to some extent. Overgrazing was noted from Carrigafoyle, Shepperton, Fergus Estuary and Knock sub-sites. See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of the saltmarsh area vegetated	Based on data from McCorry and Ryle (2009). Some poaching was noted from most of the sub-sites. See coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative sample of monitoring stops	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species-*Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry and Ryle (2009). *Spartina* is a major element of the vegetation at all sub-sites in this SAC. See coastal habitats supporting document for further details

REFERENCE DOCUMENT

1349 Bottlenose Dolphin *Tursiops truncatus*

To maintain the favourable conservation condition of Bottlenose Dolphin in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use. See map 16 for suitable habitat	See marine supporting document for further details
Habitat use: critical areas	Location and hectares	Critical areas, representing habitat used preferentially by bottlenose dolphin, should be maintained in a natural condition. See map 16	Attribute and target based on Ingram and Rogan (2002), Englund et al. (2007), Englund et al. (2008), Berrow (2009), Berrow et al. (2010) and review of data from other studies. See marine supporting document for further details
Disturbance	Level of impact	Human activities should occur at levels that do not adversely affect the bottlenose dolphin population at the site	See marine supporting document for further details

REFERENCE DOCUMENT

1355 Otter *Lutra lutra*

To restore the favourable conservation condition of Otter in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. FCS target, based on 1980/81 survey findings, is 88% in SACs. Current range in Shannon catchment estimated at 70.5% (Bailey and Rochford 2006)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 596.8ha above high water mark (HWM); 958.9ha along river banks/ around ponds	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 4,461.6ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (NPWS, 2007; Kruuk, 2006)
Extent of freshwater (river) habitat	Kilometers	No significant decline. Length mapped and calculated as 500.1km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Extent of freshwater (lake/lagoon) habitat	Hectares	No significant decline. Area mapped and calculated as 125.6ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (NPWS, 2007)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk, 2006; Kruuk and Moorhouse, 1991)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006) and wrasse and rockling in coastal waters (Kingston et al., 1999)
Barriers to connectivity	Number	No significant increase. For guidance, see map 17	Otters will regularly commute across stretches of open water up to 500m. e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed

REFERENCE DOCUMENT

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To restore the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area increasing, subject to natural processes, including erosion and succession. For sub-sites mapped: Carrigafoyle- 4.193ha; Barrigone, Aughinish- 2.407ha; Bunratty- 0.865ha; Inishdea, Owenshere- 11.609ha; Killadysert, Inishcorker- 0.705ha; Knock- 0.143ha, Querin- 0.008ha; Rinevilla Bay- 2.449ha. See map 12	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Eight sub-sites that support Mediterranean salt meadow were mapped (22.379ha) and additional areas of potential saltmarsh (25.646ha) were identified from an examination of aerial photographs, giving a total estimated area of 48.025ha. Saltmarsh habitat also occurs at 11 other sub-sites within the SAC (Curtis and Sheehy-Skeffington, 1998). NB further unsurveyed areas maybe present within the site. See coastal habitats supporting document for further details
Habitat distribution	Occurrence	No decline, or change in habitat distribution, subject to natural processes. See map 12 for known distribution	Based on data from McCorry and Ryle (2009). Within the sites surveyed by the SMP, estuary type saltmarsh over a mud substrate is most common. See coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). Embankments along much of the shoreline are a feature of this SAC. These embankments were erected in the past and much of the site has been remodelled and large areas of land reclaimed because of them. See coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain/restore creek and pan structure, subject to natural processes, including erosion and succession	Based on data from the Saltmarsh Monitoring Project (McCorry and Ryle, 2009). The MSM at Carrigafoyle contains some large salt pans. See coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Mediterranean salt meadow is found high up in the saltmarsh but requires occasional tidal inundation. See coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). Zonations to other saltmarsh habitats as well as brackish and terestrial habitats were recorded at most sub-sites. See coastal habitats supporting document for further details

REFERENCE DOCUMENT

1410 Mediterranean salt meadows (*Juncetalia maritimi*)

To restore the favourable conservation condition of Mediterranean salt meadows (*Juncetalia maritimi*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: vegetation height	Centimetres	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). All of the sub-sites are grazed to some extent. Overgrazing was noted from Inishdea, Owenshere and Knock sub-sites. See coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative sample of monitoring stops	Maintain more than 90% of area outside creeks vegetated	Based on data from McCorry and Ryle (2009). Some poaching was noted from most of the sub-sites. See coastal habitats supporting document for further details
Vegetation composition: typical species	Percentage cover	Maintain range of sub-communities with typical species listed in Saltmarsh Monitoring Project (McCorry and Ryle, 2009)	See coastal habitats supporting document for further details
Vegetation structure: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1%	Based on data from McCorry and Ryle (2009). *Spartina* is a major element of the vegetation at all sub-sites in this SAC. See coastal habitats supporting document for further details

REFERENCE DOCUMENT

3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	Three sub-types of high conservation value are know to occur in the site. See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details. **Note: rooted macrophytes should be absent or trace (< 5% cover) in freshwater pearl mussel (*Margaritifera margaritifera*) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat 3260 in the Cloon River within this SAC, because the mussel requires environmental conditions closer to natural background levels**
Habitat distribution	Occurrence	No decline, subject to natural processes. See map 13	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Hydrological regime: tidal influence	Daily water level fluctuations - metres	Maintain natural tidal regime	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Hydrological regime: freshwater seepages	Metres per second	Maintain appropriate freshwater seepage regimes	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Substratum composition: particle size range	Millimetres	The substratum should be dominated by the particle size ranges, appropriate to the habitat sub-type (frequently sands, gravels and cobbles)	Although many of the high-conservation-value sub-types are dominated by coarse substrata, for certain sub-types, notably triangular club-rush (*Schoenoplectus triqueter*) and opposite-leaved pondweed (*Groenlandia densa*), fine substrata are required. See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details

REFERENCE DOCUMENT

3260 Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

To maintain the favourable conservation condition of Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Water quality: nutrients	Milligrammes per litre	The concentration of nutrients in the water column should be sufficiently low to prevent changes in species composition or habitat condition	The specific targets may vary among sub-types. See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Vegetation composition: typical species	Occurrence	Typical species of the relevant habitat sub-type should be present and in good condition	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Floodplain connectivity	Area	The area of active floodplain at and upstream of the habitat should be maintained	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details
Riparian habitat	Area	The area of riparian woodland at and upstream of the bryophyte-rich sub-type should be maintained	See Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation supporting document for further details. See also the conservation objective for Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) (91E0)

REFERENCE DOCUMENT

6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

To maintain the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Full extent of this habitat in this site is currently unknown- see distribution below
Habitat distribution	Occurrence	No decline, subject to natural processes	This habitat has been recorded on the eastern bank of the Shannon, just north of Castleconnell, Co. Limerick (NPWS internal files). Full distribution of this habitat in this site is currently unknown and it almost certainly occurs elsewhere. The Irish semi-natural grasslands survey will cover Co. Limerick in 2012 and additional information is likely to be available following this survey
Vegetation structure: broadleaf herb: grass ratio	Percentage	Broadleaf herb component of vegetation between 40 and 90%	Attribute and target based on O'Neill et al. (2010)
Vegetation structure: sward height	Percentage	30-70% of sward between 10 and 80cm high	Attribute and target based on O'Neill et al. (2010)
Vegetation composition: typical species	Number	At least 7 positive indicator species present, including 1 "high quality" species	List of positive indicator species, including high quality species, identified by O'Neill et al. (2010). Note that purple moor-grass (*Molinia caerulea*) is a positive indicator species, but not necessarily an essential component of the habitat
Vegetation composition: notable species	Number	No decline, subject to natural processes	A number of notable species have been recorded in this habitat at this site including smooth brome (*Bromus racemosus*), pale sedge (*Carex pallescens*) and blue-eyed grass (*Sisyrinchium bermudiana*) (Reynolds et al., 2006)
Vegetation composition: negative indicator species	Percentage	Negative indicator species collectively not more than 20% cover, with cover by an individual species less than 10%. Non-native invasive species, absent or under control	List of negative indicator species identified by O'Neill et al. (2010)
Vegetation composition: negative indicator moss species	Percentage	Bog mosses (*Sphagnum* spp.) not more than 10% cover; hair mosses (*Polytrichum* spp.) not more than 25% cover	Attribute and target based on O'Neill et al. (2010)

REFERENCE DOCUMENT

6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

To maintain the favourable conservation condition of *Molinia* meadows on calcareous, peaty or clayey-silt laden soils (*Molinion caeruleae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Vegetation structure: woody species and bracken (*Pteridium aquilinum*)	Percentage	Cover of woody species and bracken not more than 5% cover	Attribute and target based on O'Neill et al. (2010)
Physical structure: bare ground	Percentage	Not more than 10% bare ground	Attribute and target based on O'Neill et al. (2010)

REFERENCE DOCUMENT

91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

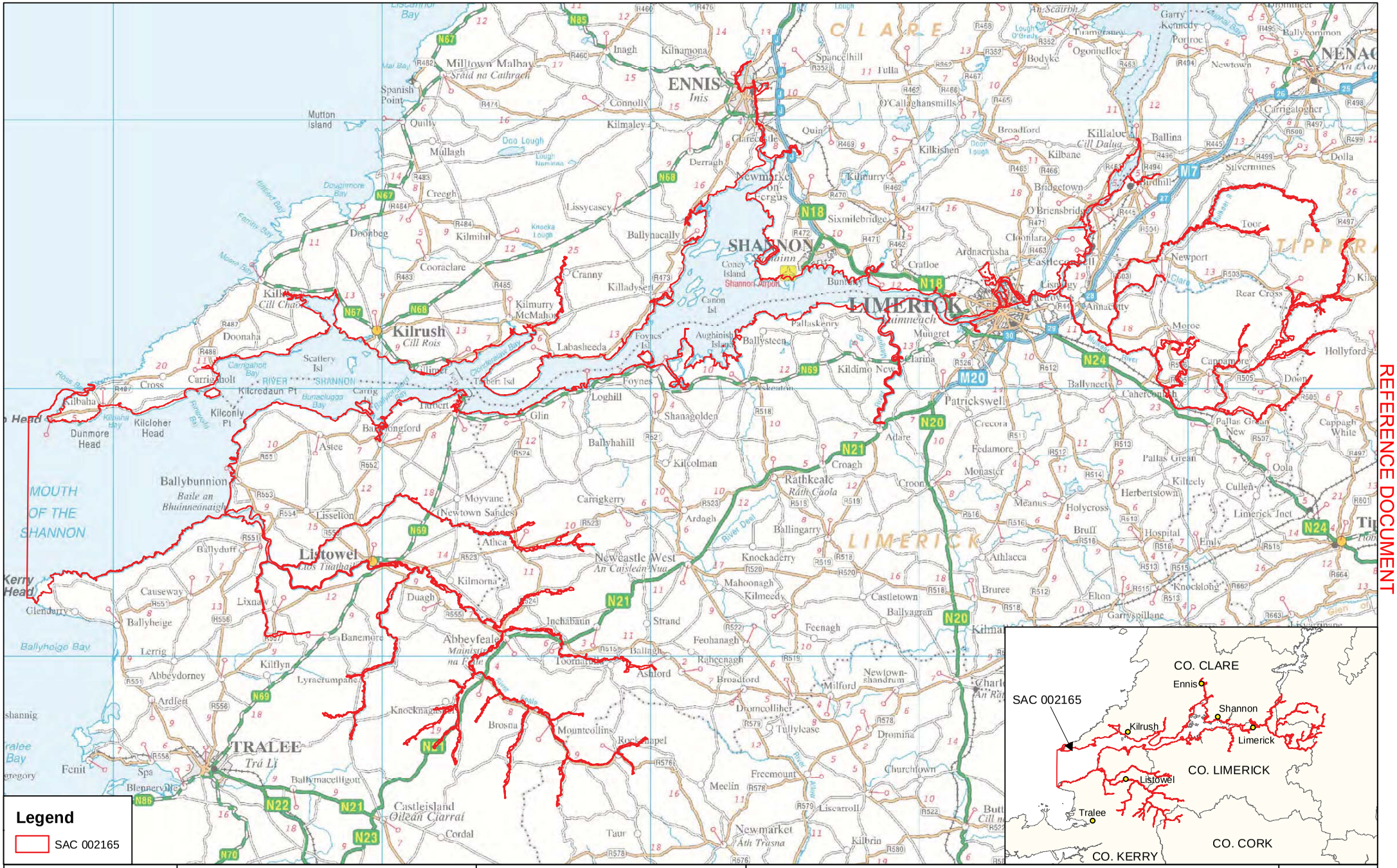
Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least c.8.5ha for sites surveyed. See map 14	Minimum area, based on 5 sites surveyed by Perrin et al. (2008) - site codes 1286, 1577, 1857, 1861, 1995. See woodland habitats supporting document for further details. NB further areas are likely to be present within the SAC
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 14	Distribution based on Perrin et al. (2008). NB further areas are likely to be present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and “small” woods at least 3ha in size	The sizes of at least some of the existing woodlands need to be increased in order to reduce habitat fragmentation and benefit those species requiring ‘deep’ woodland conditions (Peterken, 2002). Topographical and land-ownership constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008). See woodland habitats supporting document for further details
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008). See woodland habitats supporting document for further details
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Alder and oak regenerate poorly. Ash often regenerates in large numbers although few seedlings reach pole size
Hydrological regime: flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river floodplains
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least 30m^3/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder)	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem

REFERENCE DOCUMENT

91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*)

To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) in the Lower River Shannon SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-data and other rare or localised species. Perrin and Daly (2010) list four sites as containing potential ancient/long established woodland. See woodland habitats supporting document for further details
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008)
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including alder (*Alnus glutinosa*), willows (*Salix* spp) and, locally, oak (*Quercus robur*) and ash (*Fraxinus excelsior*)	Species reported in Perrin et al. (2008). See woodland habitats supporting document for further details
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The following are the most common invasive species in this woodland type: Himalayan balsam (*Impatiens glandulifera*), giant hogweed (*Heracleum mantegazzianum*), sycamore (*Acer pseudoplatanus*)



REFERENCE DOCUMENT

Legend

SAC 002165

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 1:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 20 km

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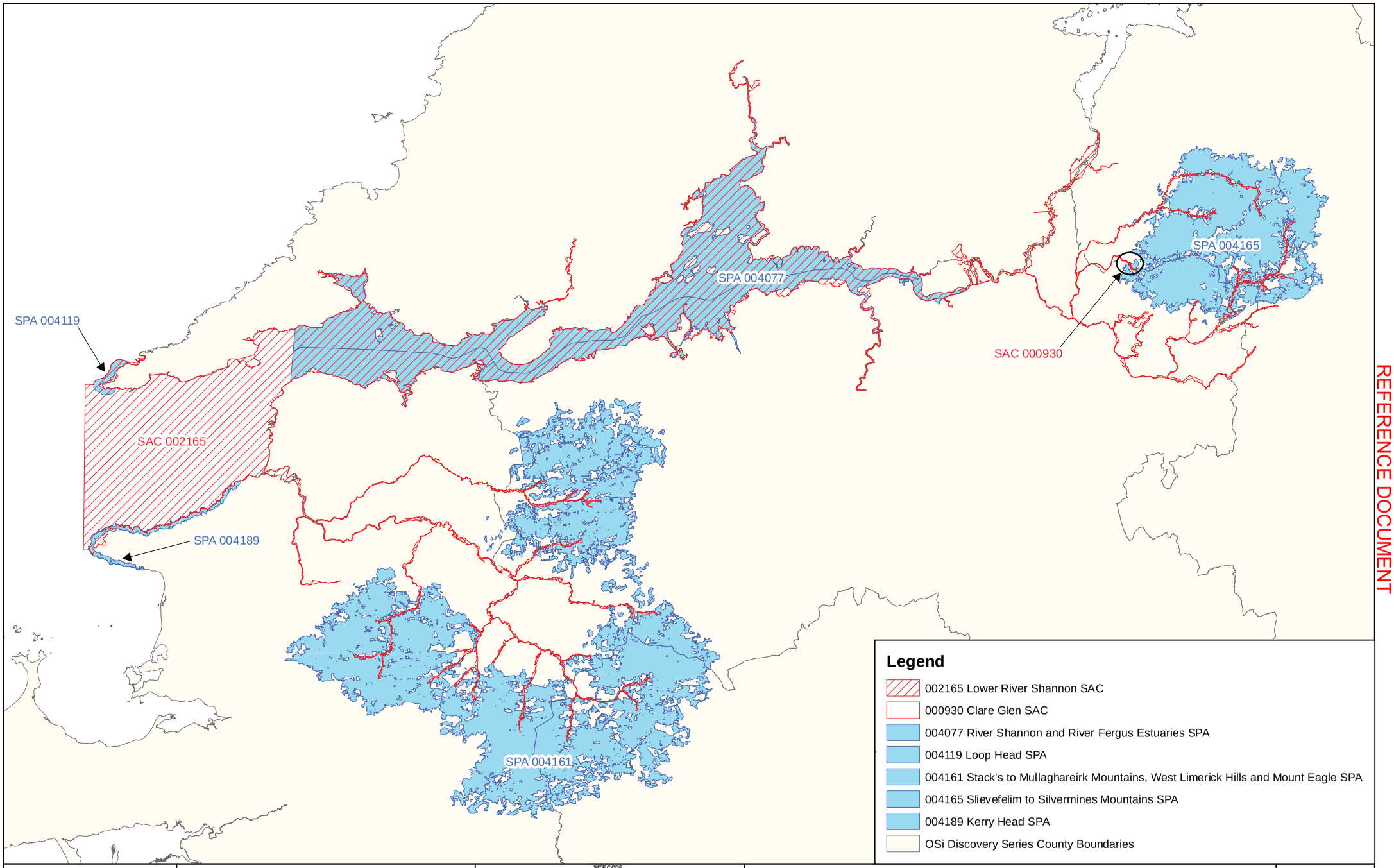
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach gineartálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadunas Uimh. EN 0059208)

N

Map Version 1
Date: June 2012



REFERENCE DOCUMENT

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MAP 2:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002165 CO. CLARE; v1.2, CO. CORK; v1.01, CO. KERRY; v1.11, CO. LIMERICK; v1.11, CO. TIPPERARY; v1.05/SAC 000930 CO LIMERICK; v1, CO. TIPPERARY; v1
SPA 004077 CO CLARE; v1.03, CO KERRY; v1.02, CO LIMERICK; v1.03/SPA 004119 CO CLARE; v1.02
SPA 004161 CO CORK; v2.12, CO KERRY; v2.17, CO LIMERICK; v2.14
SPA 004165 CO LIMERICK; v2.05, CO TIPPERARY; v2.09/SPA 004189 CO KERRY; v2.01

0 5 10 15 20 km

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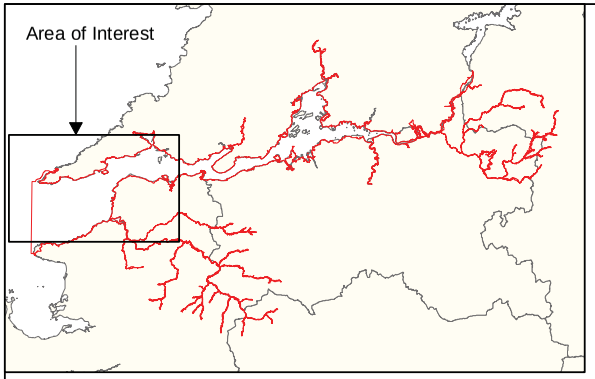
N

Map Version 1
Date: June 2012



REFERENCE DOCUMENT

Legend

- SAC 002165
- 1110 Sandbanks which are slightly covered by sea water all the time
- OSi Discovery Series County Boundaries

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Department of Arts, Heritage and the Gaeltacht

MAP 3: LOWER RIVER SHANNON SAC CONSERVATION OBJECTIVES SANDBANKS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

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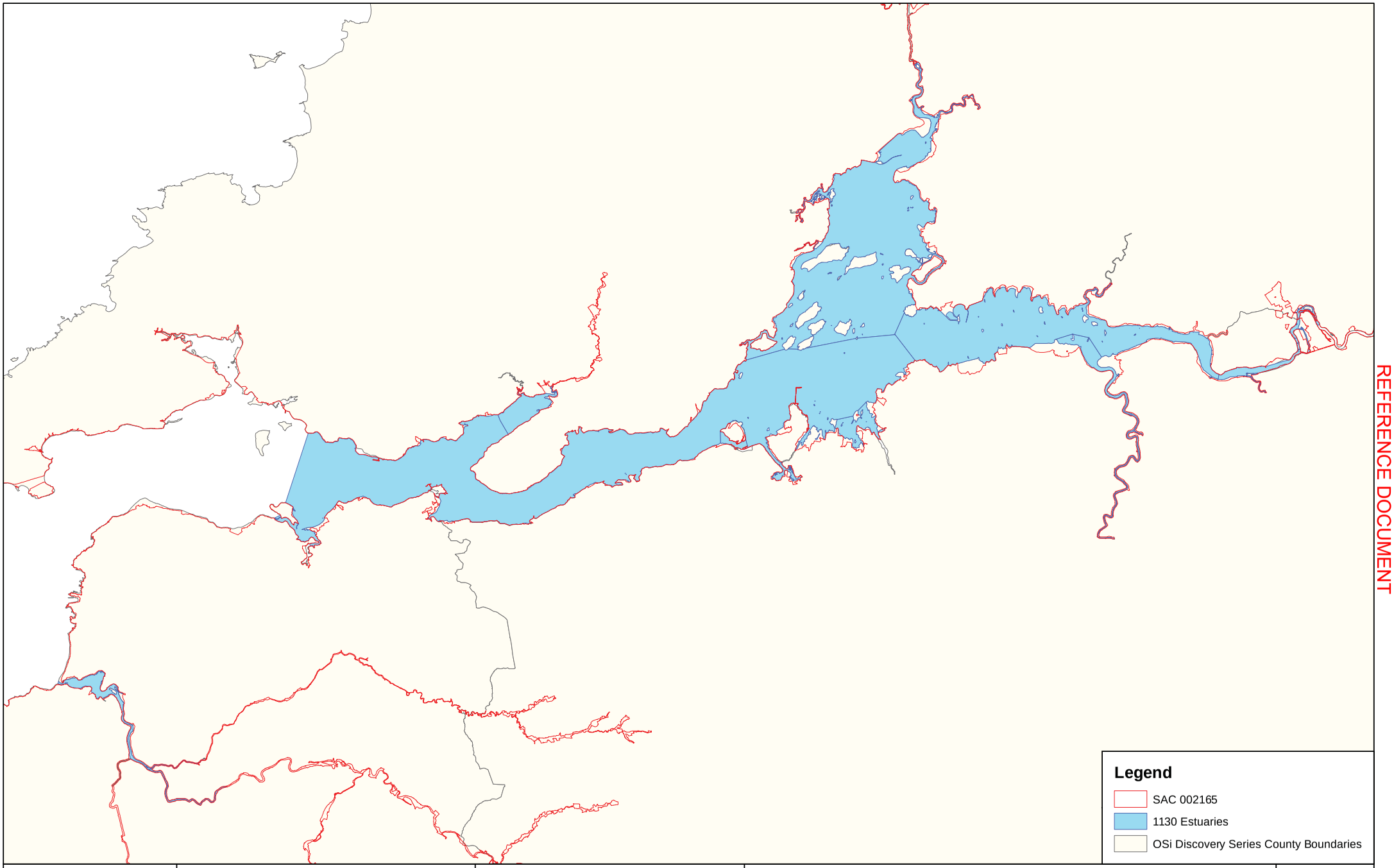
N

Map Version 1
Date: June 2012



REFERENCE DOCUMENT

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Department of Arts, Heritage and the Gaeltacht

MAP 4:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
ESTUARIES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 2 4 6 8 10 km

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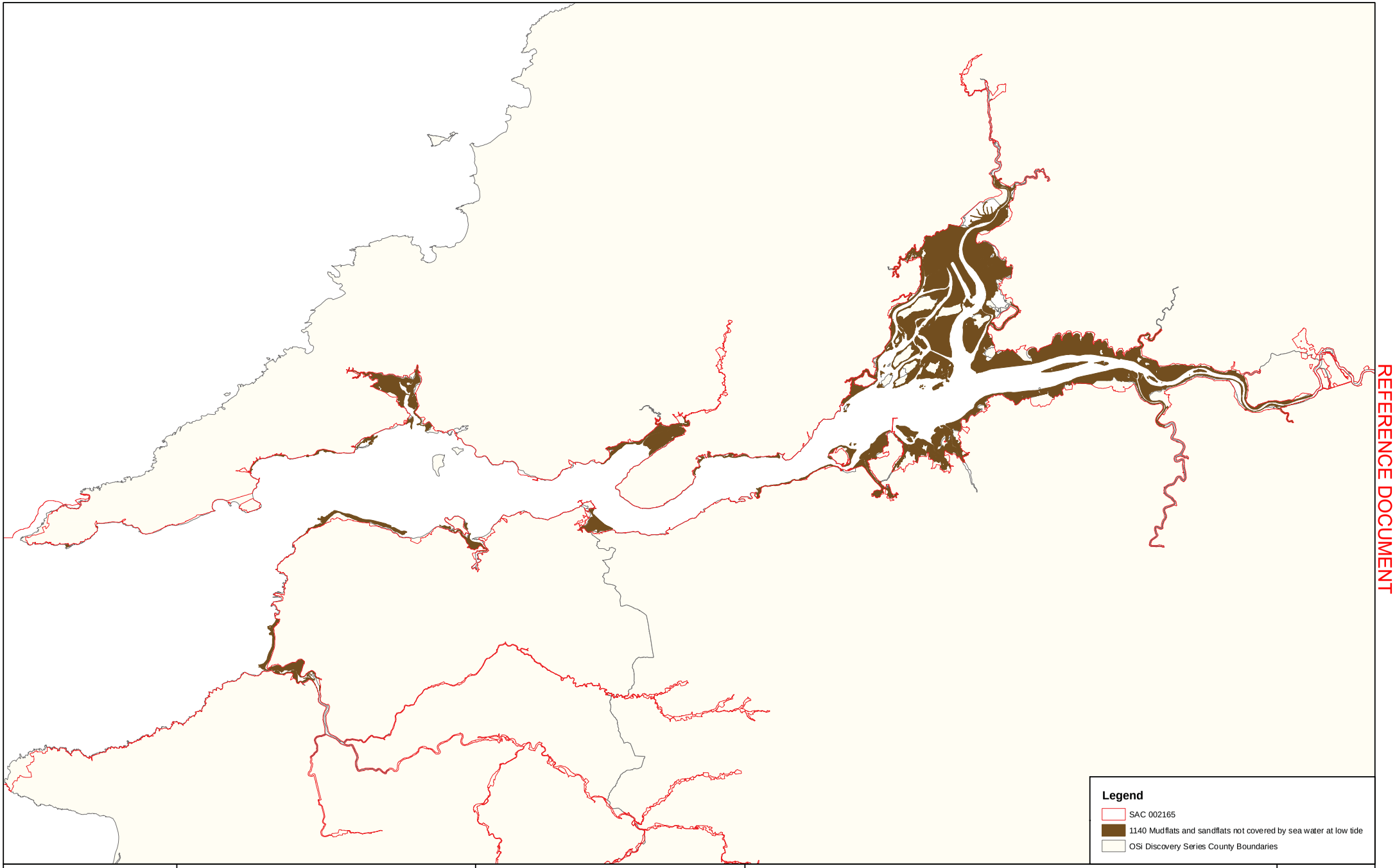
Map Version 1
Date: June 2012



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An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 5:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
TIDAL MUDFLATS AND SANDFLATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

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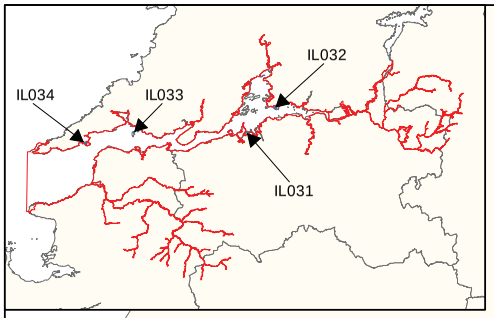
Map Version 1
Date: June 2012



Quayfield and Poulaweala Loughs
IL031

Shannon Airport Lagoon
IL032

Scattery Lagoon
IL033

Cloonconeen Pool
IL034

Legend

- SAC 002165
- 1150 Coastal lagoons
- OSi Discovery Series County Boundaries

REFERENCE DOCUMENT

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MAP 6:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
COASTAL LAGOONS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 100 200 300 400 500 m

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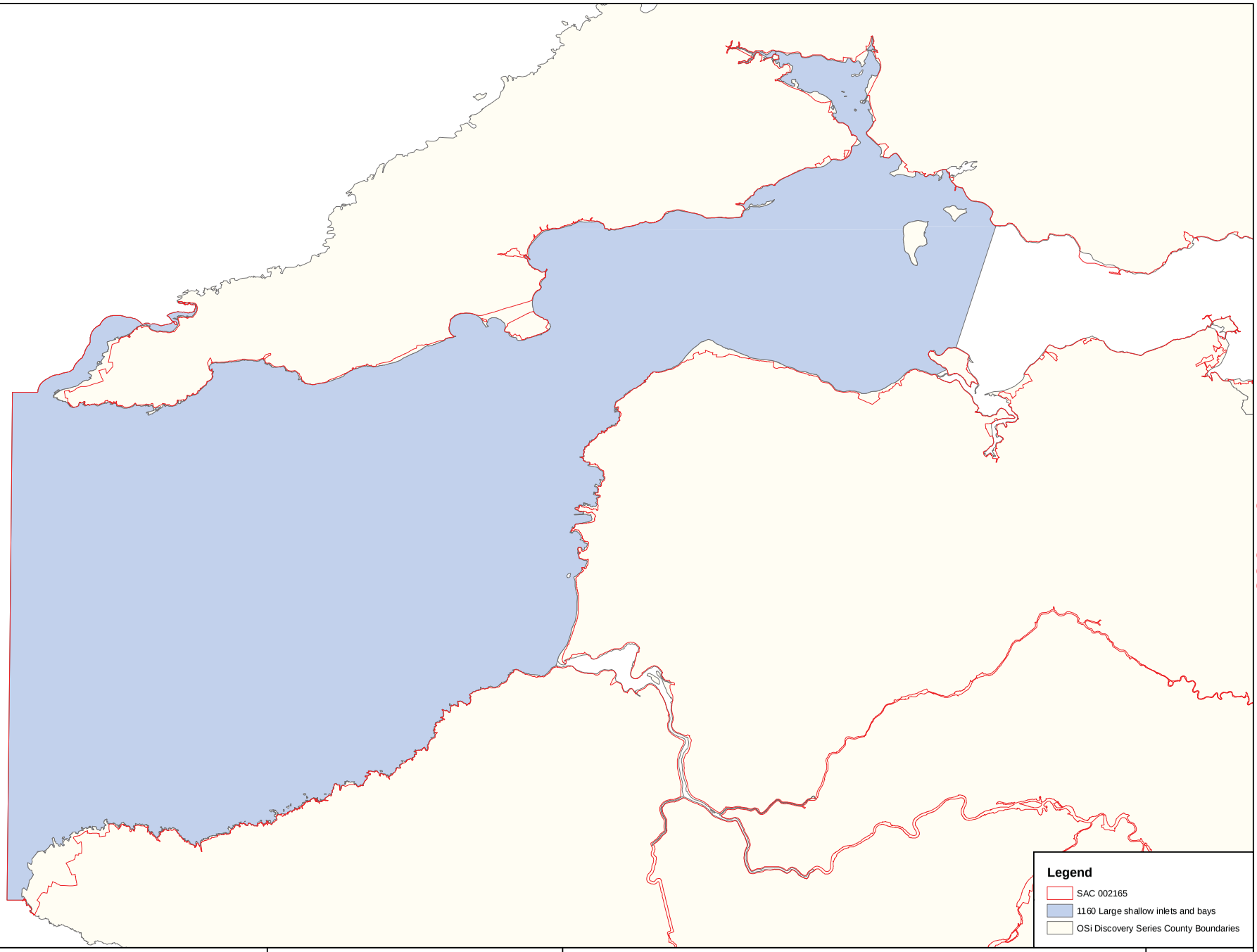
Map Version 1
Date: June 2012



REFERENCE DOCUMENT

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MAP 7:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
LARGE SHALLOW INLETS AND BAYS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

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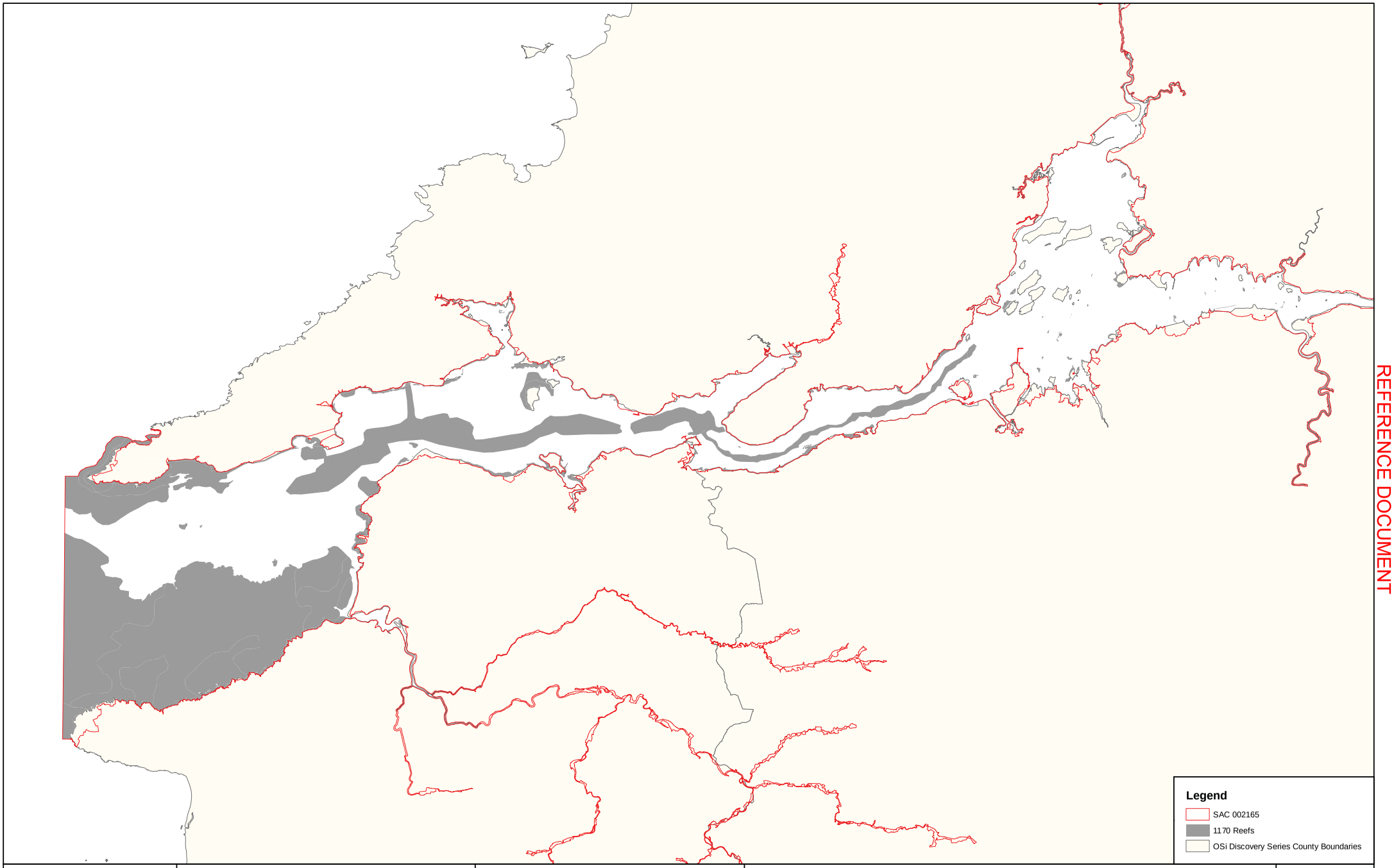
Map Version 1
Date: June 2012



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Department of Arts, Heritage and the Gaeltacht

MAP 8:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
REEFS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

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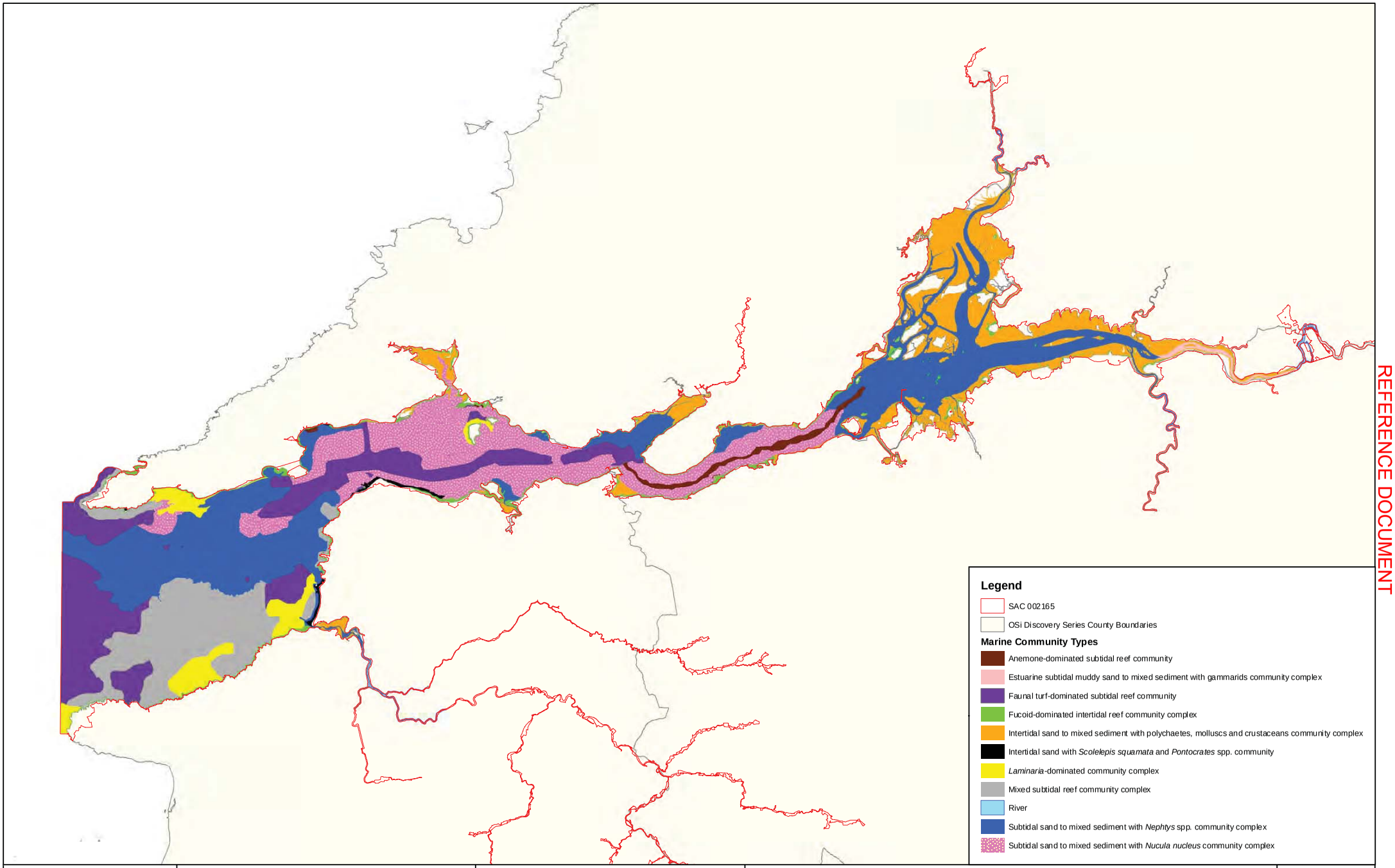
Map Version 1
Date: June 2012



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Department of Arts, Heritage and the Gaeltacht

MAP 9:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
MARINE COMMUNITY TYPES

Map to be read in conjunction with the NPWS Conservation Objectives Document.

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CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

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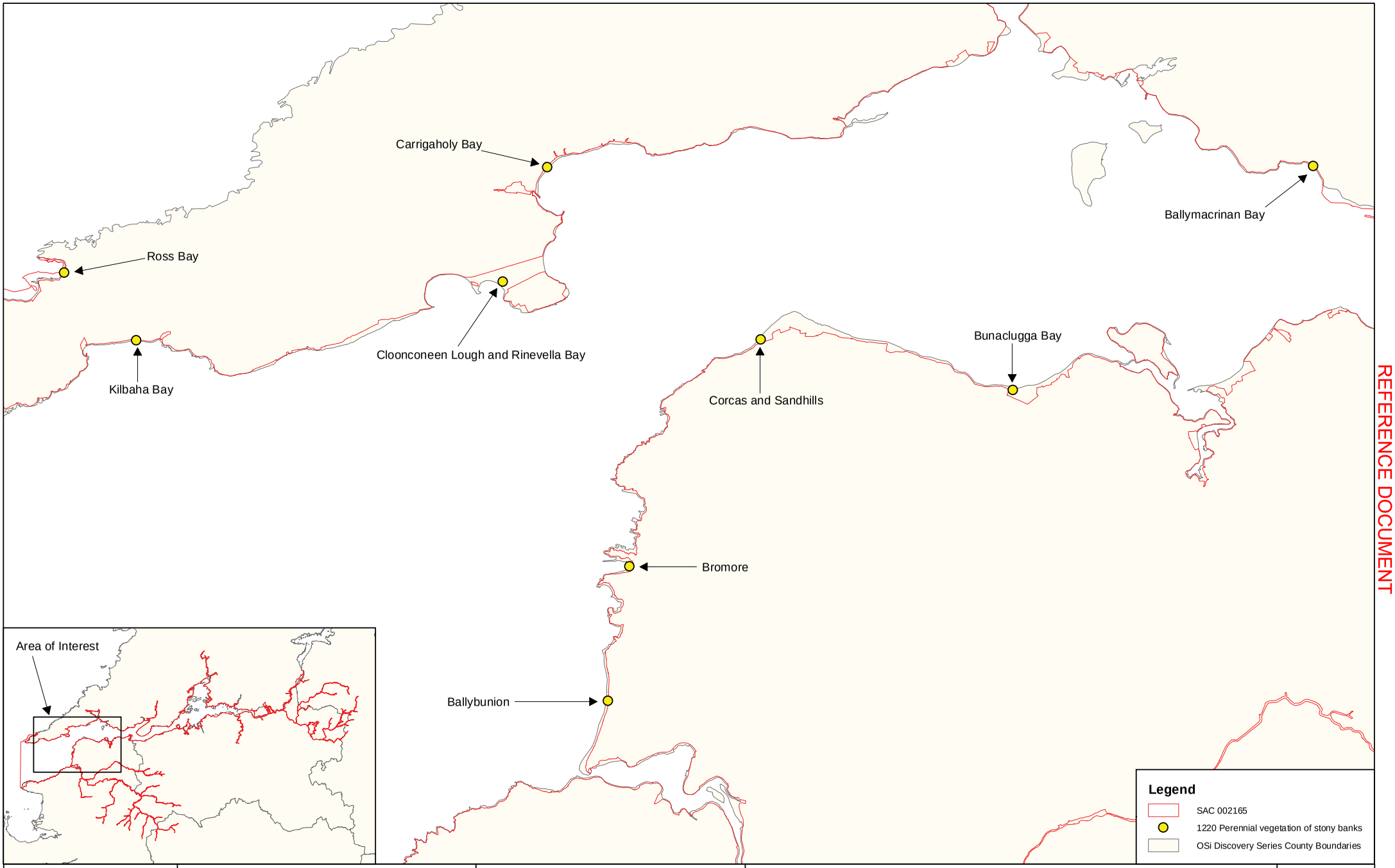
Map Version 1
Date: June 2012



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Department of Arts, Heritage and the Gaeltacht

MAP 10:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
PERENNIAL VEGETATION OF STONY BANKS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

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Map Version 1
Date: June 2012

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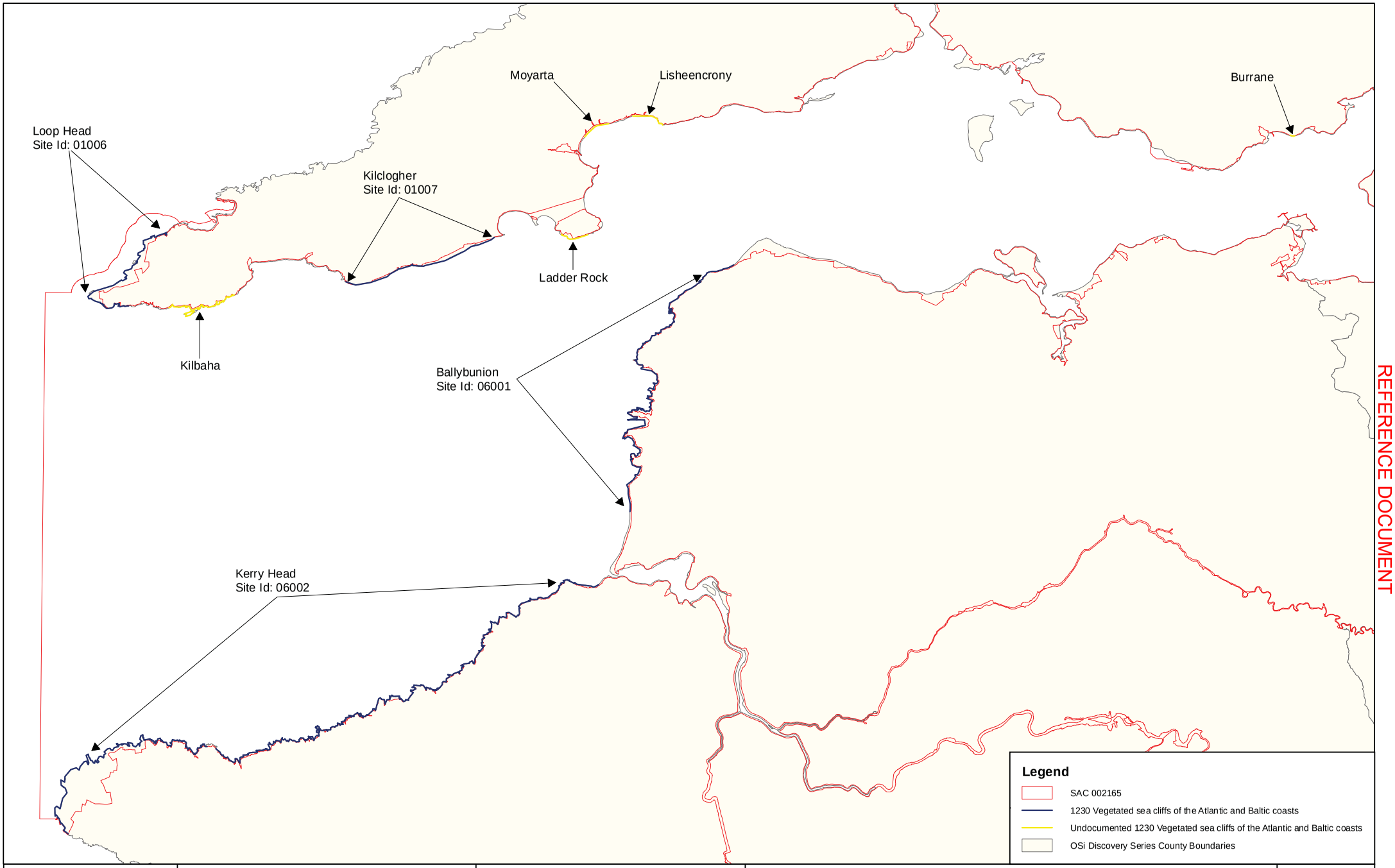

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Department of Arts, Heritage and the Gaeltacht

MAP 11:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
VEGETATED SEA CLIFFS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

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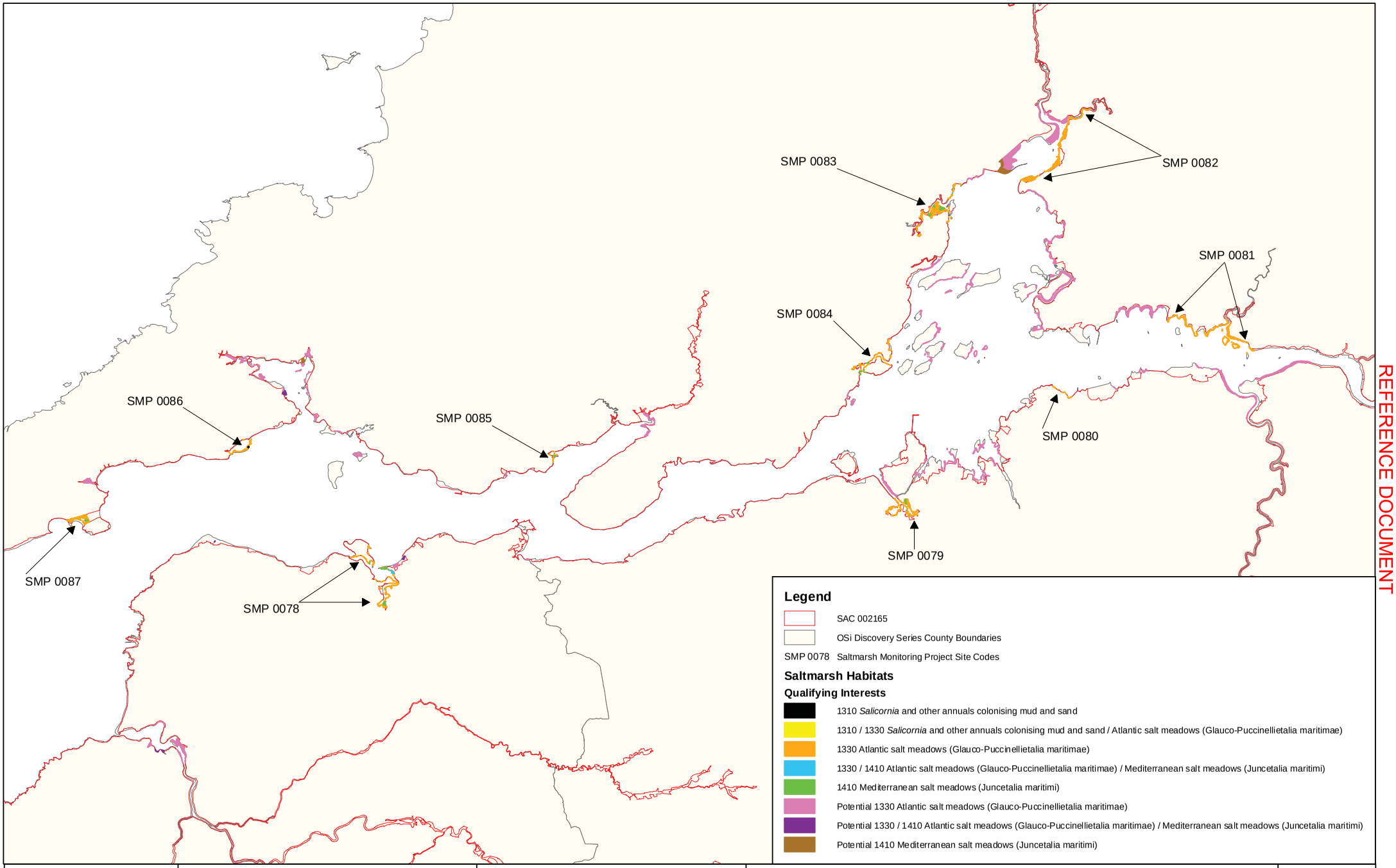
Map Version 1
Date: June 2012



Legend

- SAC 002165
- OSi Discovery Series County Boundaries
- SMP 0078 Saltmarsh Monitoring Project Site Codes

Saltmarsh Habitats

Qualifying Interests

- 1310 *Salicornia* and other annuals colonising mud and sand
- 1310 / 1330 *Salicornia* and other annuals colonising mud and sand / Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
- 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
- 1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)
- 1410 Mediterranean salt meadows (Juncetalia maritimi)
- Potential 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
- Potential 1330 / 1410 Atlantic salt meadows (Glauco-Puccinellietalia maritimae) / Mediterranean salt meadows (Juncetalia maritimi)
- Potential 1410 Mediterranean salt meadows (Juncetalia maritimi)

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MAP 12:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
SALTMARSH HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

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CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 2 4 6 8 10 km

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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach gineartha. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le cead ón Rialtas (Ceadunas Uimh. EN 0059208)

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Map Version 1
Date: June 2012

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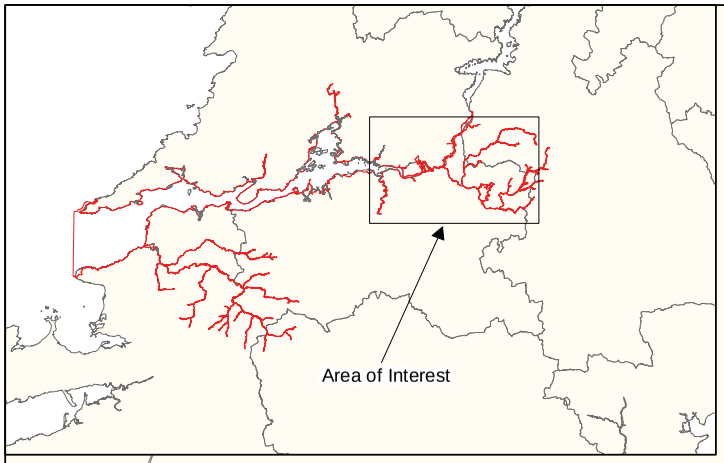

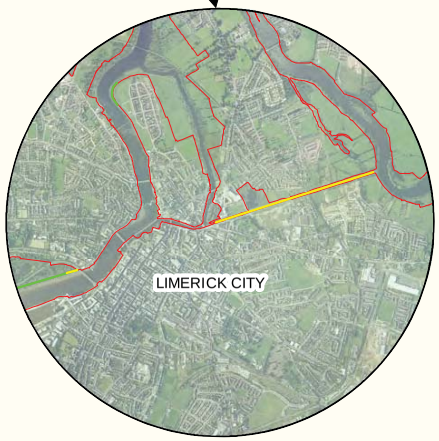

Legend

- SAC 002165
- OSi Discovery Series County Boundaries

3260 Watercourses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation

- *Groenlandia densa*
- *Schoenoplectus triqueter*
- Bryophyte-rich streams and rivers sub-type

REFERENCE DOCUMENT

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MAP 13:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
FLOATING RIVER VEGETATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 1 2 3 4 5 km

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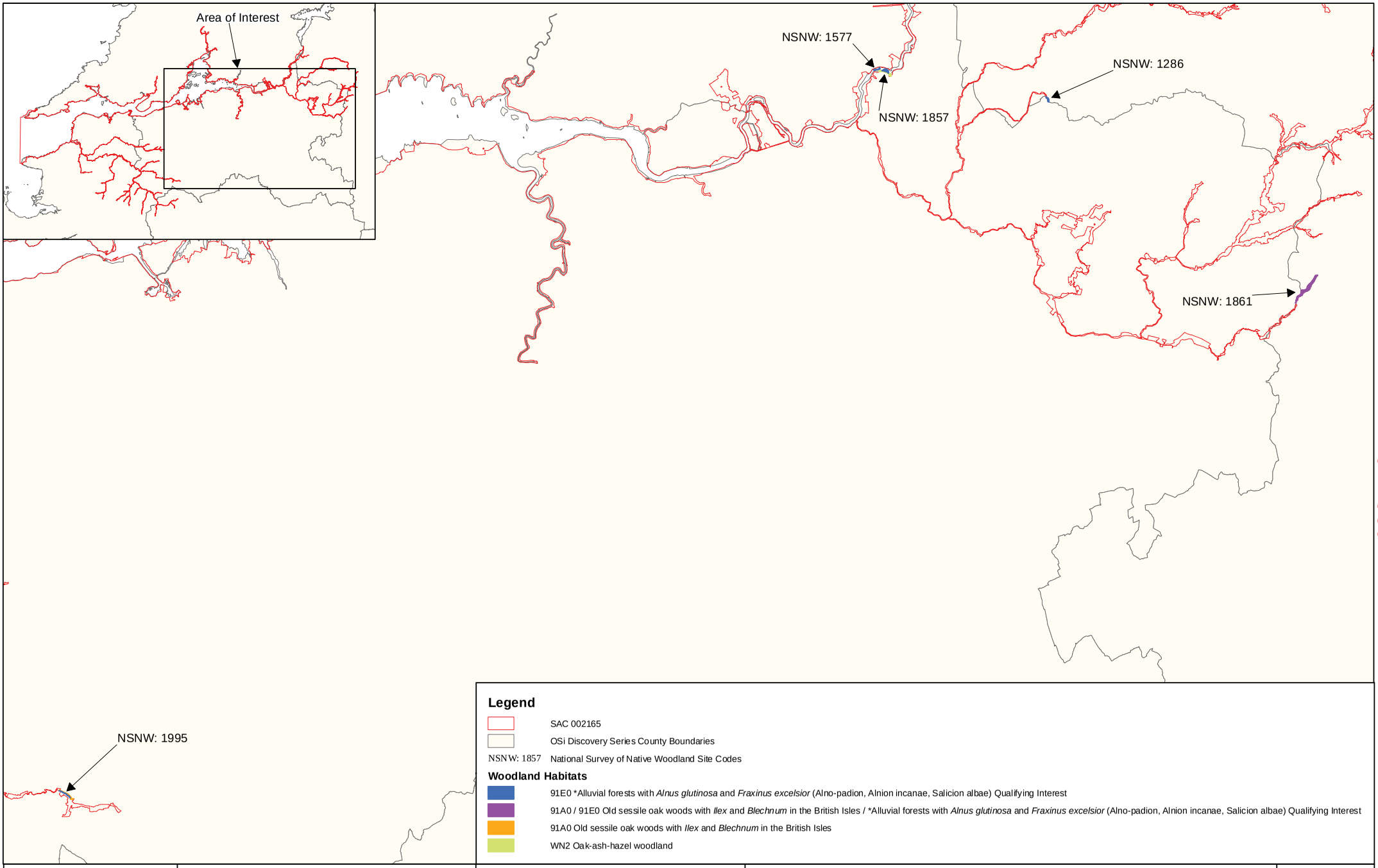
Date: June 2012



REFERENCE DOCUMENT

Legend

- SAC 002165
- OSi Discovery Series County Boundaries
- NSNW: 1857 National Survey of Native Woodland Site Codes

Woodland Habitats

- 91E0 *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae) Qualifying Interest
- 91A0 / 91E0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles / *Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-padion, Alnion incanae, Salicion albae) Qualifying Interest
- 91A0 Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
- WN2 Oak-ash-hazel woodland

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Department of Arts, Heritage and the Gaeltacht

MAP 14: LOWER RIVER SHANNON SAC CONSERVATION OBJECTIVES WOODLAND HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 2 4 6 8 10 km

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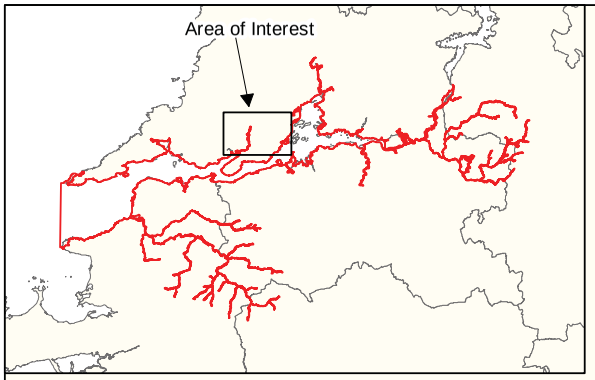

REFERENCE DOCUMENT

Legend

- SAC 002165
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Suitable Habitat
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Distribution
- 1029 Freshwater Pearl Mussel - *Margaritifera margaritifera* Catchment
- OSi Discovery Series County Boundaries

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MAP 15:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
FRESHWATER PEARL MUSSEL

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 0.5 1 1.5 2 km

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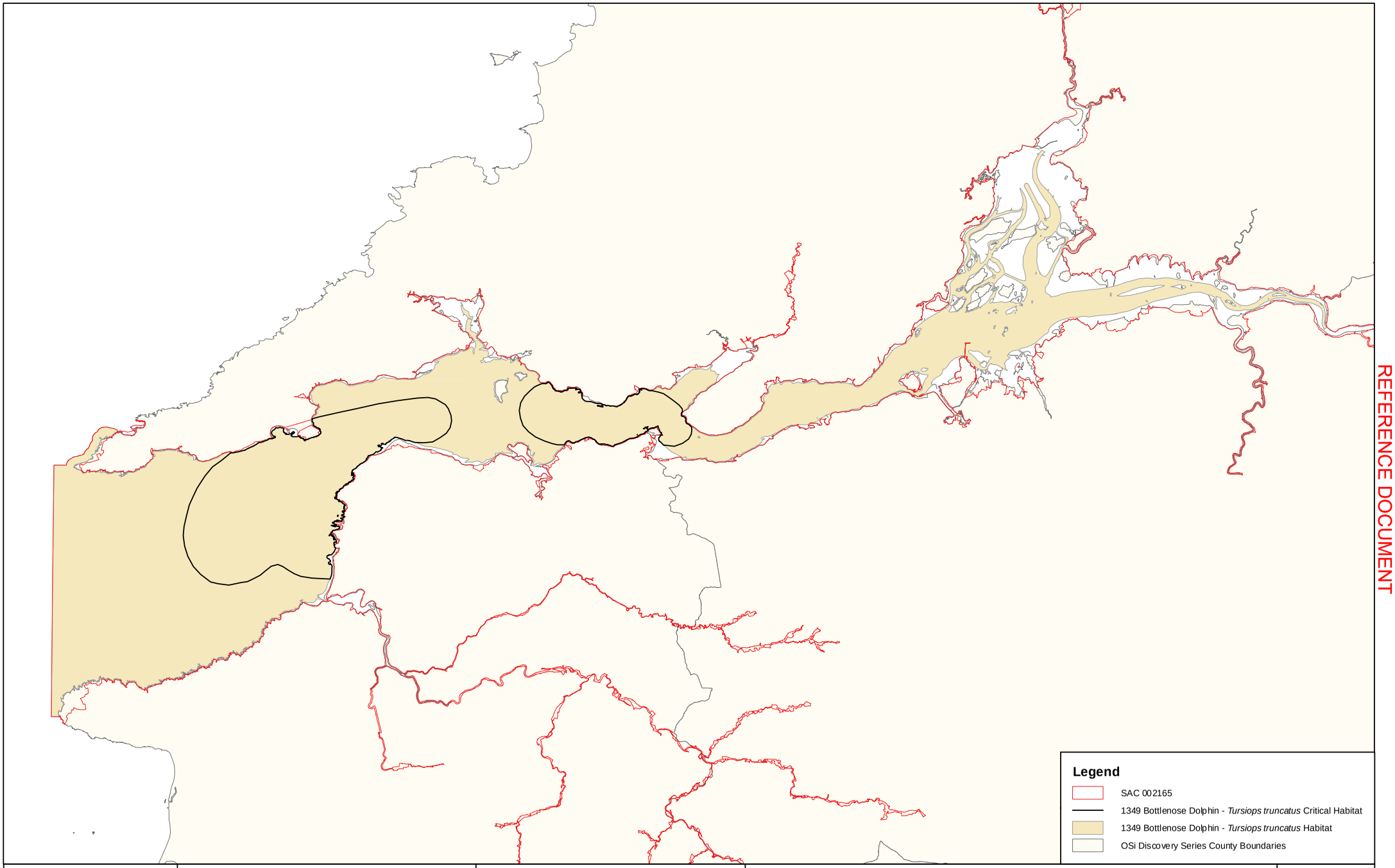
Map Version 1
Date: June 2012



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Department of Arts, Heritage and the Gaeltacht

MAP 16:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
BOTTLENOSE DOLPHIN

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002165
CO. CLARE; version 1.2, CO. CORK; version 1.01, CO. KERRY; version 1.11, CO. LIMERICK; version 1.11, CO. TIPPERARY; version 1.05

0 5 10 15 km

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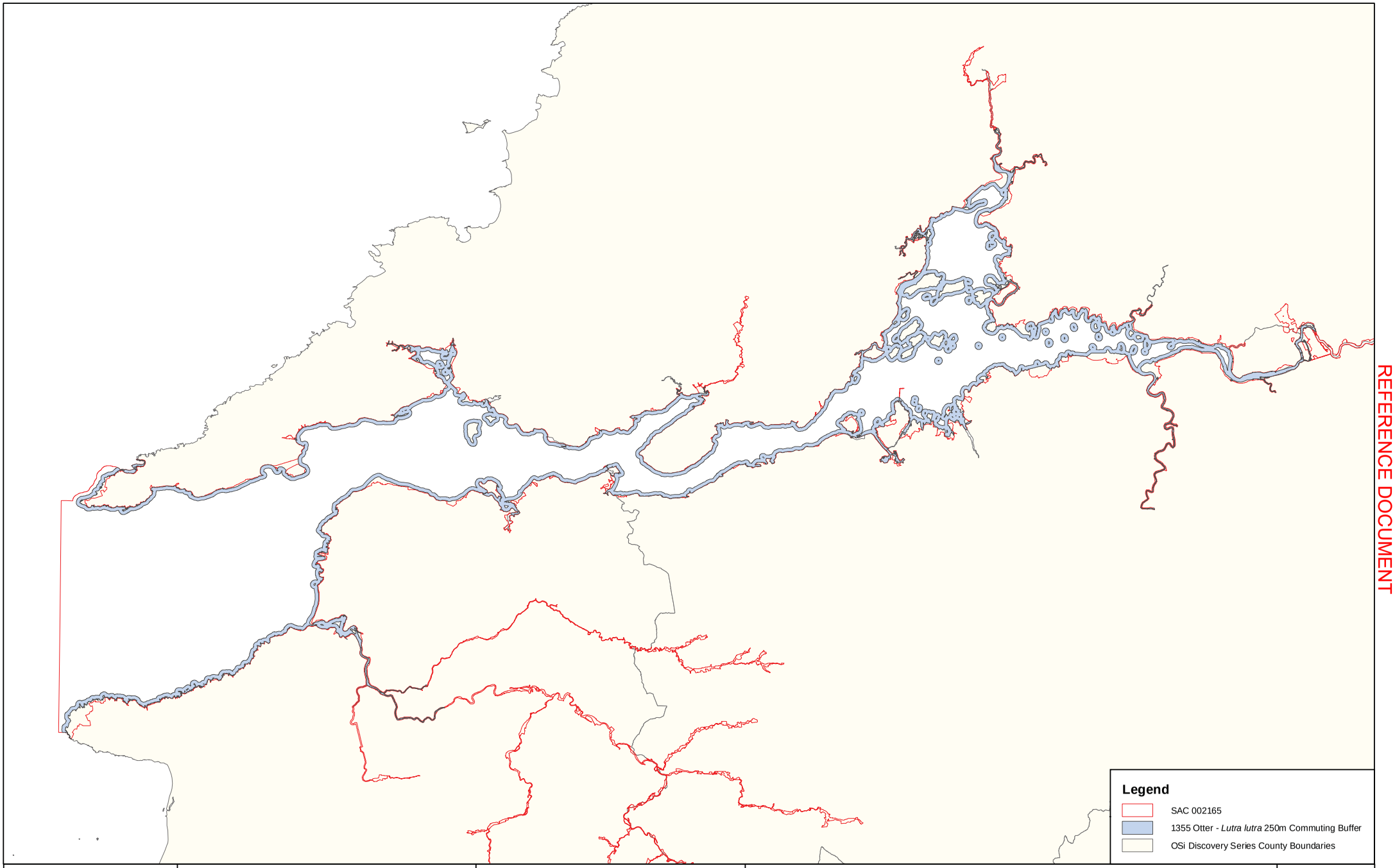
Map Version 1
Date: June 2012



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MAP 17:
LOWER RIVER SHANNON SAC
CONSERVATION OBJECTIVES
OTTER COMMUTING

Map to be read in conjunction with the NPWS Conservation Objectives Document.

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0 5 10 15 km

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Map Version 1
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National Parks and Wildlife Service

Conservation Objectives Series

Lower River Suir SAC 002137

An Roinn Ealaíon, Oidhreachta,
Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

Department of Arts, Heritage,
Regional, Rural and Gaeltacht Affairs

National Parks and Wildlife Service,
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs,

7 Ely Place, Dublin 2, Ireland.

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E-mail: nature.conservation@ahg.gov.ie

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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002137	Lower River Suir SAC
1029	Freshwater Pearl Mussel *Margaritifera margaritifera*
1092	White-clawed Crayfish *Austropotamobius pallipes*
1095	Sea Lamprey *Petromyzon marinus*
1096	Brook Lamprey *Lampetra planeri*
1099	River Lamprey *Lampetra fluviatilis*
1103	Twaite Shad *Alosa fallax fallax*
1106	Salmon *Salmo salar*
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)
1355	Otter *Lutra lutra*
1410	Mediterranean salt meadows (Juncetalia maritimi)
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels
91A0	Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
91E0	Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)*
91J0	*Taxus baccata* woods of the British Isles*

Please note that this SAC is adjacent to River Barrow and River Nore SAC (002162). See map 2. The conservation objectives for this site should be used in conjunction with those for the adjacent site as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1998
Title :	Conservation management of the white-clawed crayfish, *Austropotamobius pallipes*
Author :	Reynolds, J.D.
Series :	Irish Wildlife Manual No. 1
Year :	2006
Title :	Otter survey of Ireland 2004/2005
Author :	Bailey, M.; Rochford, J.
Series :	Irish Wildlife Manual No. 23
Year :	2006
Title :	Initiation of a monitoring program for the freshwater pearl mussel, *Margaritifera margaritifera*, in the Clodiagh River (Suir)
Author :	Ross, E.
Series :	Unpublished report to NPWS
Year :	2007
Title :	A survey of juvenile lamprey populations in the Corrib and Suir catchments
Author :	O'Connor, W.
Series :	Irish Wildlife Manual No. 26
Year :	2007
Title :	Supporting documentation for the Habitats Directive Conservation Status Assessment - backing documents. Article 17 forms and supporting maps
Author :	NPWS
Series :	Unpublished report to NPWS
Year :	2008
Title :	National survey of native woodlands 2003-2008
Author :	Perrin, P.M.; Martin, J.; Barron, S.; O'Neill, F.H.; McNutt, K.E.; Delaney, A.
Series :	Unpublished report to NPWS
Year :	2009
Title :	Saltmarsh monitoring project 2007-2008
Author :	McCorry, M.; Ryle, T.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II freshwater pearl mussel sub-basin management plans: monitoring of the freshwater pearl mussel in the Clodiagh
Author :	Ross, E.
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II freshwater pearl mussel sub-basin management plans: fisheries survey. Stage 1 report
Author :	Paul Johnston Associates
Series :	Unpublished report to NPWS
Year :	2009
Title :	NS II freshwater pearl mussel sub-basin management plans: report on biological monitoring of surface water quality in Clodiagh (Waterford) catchment
Author :	Morgan, G.
Series :	Unpublished report to NPWS

Year :	2010
Title :	A provisional inventory of ancient and long-established woodland in Ireland
Author :	Perrin, P.M.; Daly, O.H.
Series :	Irish Wildlife Manual No. 46
Year :	2010
Title :	A technical manual for monitoring white-clawed crayfish (*Austropotamobius pallipes*) in Irish lakes
Author :	Reynolds, J., O'Connor, W., O'Keeffe, C.; Lynn, D.
Series :	Irish Wildlife Manual No.45
Year :	2010
Title :	Second draft Clodiagh freshwater pearl mussel sub-basin management plan (2009-2015). March 2010
Author :	NPWS
Series :	Unpublished document to the Department of Environment, Heritage and Local Government
Year :	2010
Title :	NS2 freshwater pearl mussel sub-basin management plans. Phytobenthos monitoring of the Clodiagh catchment, Co. Waterford (SERBD). June and July
Author :	Ní Chatháin, B.
Series :	Unpublished report to NPWS
Year :	2012
Title :	Lower River Shannon SAC (site code: 2165) Conservation objectives supporting document- Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2013
Title :	National otter survey of Ireland 2010/12
Author :	Reid, N.; Hayden, B.; Lundy, M.G.; Pietravalle, S.; McDonald, R.A.; Montgomery, W.I.
Series :	Irish Wildlife Manual No. 76
Year :	2013
Title :	Irish semi-natural grasslands survey 2007-2012
Author :	O'Neill, F.H.; Martin, J.R.; Devaney, F.M.; Perrin, P.M.
Series :	Irish Wildlife Manual No. 78
Year :	2013
Title :	Results of monitoring survey of old sessile oak woods and alluvial forests
Author :	O'Neill, F.H.; Barron, S.J.
Series :	Irish Wildlife Manual No. 71
Year :	2013
Title :	Results of a monitoring survey of yew woodland
Author :	Cross, J.; Lynn, D.
Series :	Irish Wlidlife Manual No. 72
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 3. Species assessments
Author :	NPWS
Series :	Conservation assessments

Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS
Year :	2017
Title :	Lower River Suir SAC (site code: 2137) Conservation objectives supporting document- coastal habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document
Year :	2017
Title :	Survey and condition assessment of the freshwater pearl mussel, *Margaritifera margaritifera* (L.), in the Clodiagh River (Suir, Portlaw)
Author :	Ross, E.; Moorkens, E.; Killeen, I.
Series :	Unpublished report to NPWS

Other References

Year :	1898
Title :	Contributions towards a Cybele Hibernica. Second Edition
Author :	Colgan, N.; Scully, R.W.
Series :	Edward Ponsonby, Dublin
Year :	1982
Title :	Otter survey of Ireland
Author :	Chapman, P.J.; Chapman, L.L.
Series :	Unpublished report to Vincent Wildlife Trust
Year :	1988
Title :	The reproductive biology of freshwater mussels in Ireland, with observations on their distribution and demography
Author :	Ross, E.D.
Series :	Unpublished Ph.D. Thesis, National University of Ireland, Galway
Year :	1991
Title :	The spatial organization of otters (*Lutra lutra*) in Shetland
Author :	Kruuk, H.; Moorhouse, A.
Series :	Journal of Zoology, 224: 41-57
Year :	1992
Title :	Status of the freshwater pearl mussels *Margaritifera margaritifera* and *M. m. durrovensis* in the Nore, Barrow and Suir River tributaries, south-east Ireland
Author :	Moorkens, E.A.; Costello, M.J.; Speight, M.C.D.
Series :	Irish Naturalists' Journal, 24(3): 127-131
Year :	1996
Title :	Studies on the biology and ecology of *Margaritifera* in Ireland
Author :	Moorkens, E.
Series :	Unpublished Ph.D. thesis, University of Dublin, Trinity College.
Year :	1999
Title :	Diet of otters (*Lutra lutra*) on Inishmore, Aran Islands, west coast of Ireland
Author :	Kingston, S.; O'Connell, M.; Fairley, J.S.
Series :	Biology and Environment: Proceedings of the Royal Irish Academy, 99B: 173-182

Year :	2001
Title :	Aquatic plants in Britain and Ireland
Author :	Preston, C.D.; Croft, J.M.
Series :	Harley Books, Colchester
Year :	2002
Title :	Reversing the habitat fragmentation of British woodlands
Author :	Peterken, G.
Series :	WWF-UK, London
Year :	2002
Title :	A survey of the white-clawed crayfish (*Austropotamobius pallipes*) Lereboullet and of water quality in two catchments of eastern Ireland
Author :	Demers, A.; Reynolds, J.D.
Series :	Bulletin Francais de la Peche et de la Pisciculture, 367: 729-740
Year :	2003
Title :	Monitoring the river, sea and brook lamprey, *Lampetra fluviatilis*, *L. planeri* and *Petromyzon marinus*
Author :	Harvey, J.; Cowx, I.
Series :	Conserving Natura 2000 Rivers Monitoring Series No. 5. English Nature, Peterborough
Year :	2003
Title :	Ecology of watercourses characterised by Ranunculion fluitantis and Callitricho-Batrachion Vegetation
Author :	Hatton-Ellis, T.W.; Grieve, N.
Series :	Conserving Natura 2000 Rivers Ecology Series No. 11. English Nature, Peterborough
Year :	2003
Title :	Ecology of the allis and twaite shad
Author :	Maitland, P.S.; Hatton-Ellis, T.W.
Series :	Conserving Natura 2000 Rivers Ecology Series No. 3. English Nature, Peterborough
Year :	2003
Title :	Pondweeds of Great Britain and Ireland
Author :	Preston, C.D.
Series :	BSBI Handbook, No. 8, London
Year :	2003
Title :	Identifying lamprey. A field key for sea, river and brook lamprey
Author :	Gardiner, R.
Series :	Conserving Natura 2000 rivers, Conservation techniques No. 4. English Nature, Peterborough
Year :	2006
Title :	Otters - ecology, behaviour and conservation
Author :	Kruuk, H.
Series :	Oxford University Press
Year :	2006
Title :	The status of host fish populations and fish species richness in European freshwater pearl mussel (*Margaritifera margaritifera*) streams
Author :	Geist, J.; Porkka, M.; Kuehn, R.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 16: 251-266
Year :	2007
Title :	Evolutionary history of lamprey paired species *Lampetra fluviatilis* L. and *Lampetra planeri* Bloch as inferred from mitochondrial DNA variation
Author :	Espanhol, R.; Almeida, P.R.; Alves, M.J.
Series :	Molecular Ecology, 16: 1909-1924

Year :	2008
Title :	Poor water quality constrains the distribution and movements of twaite shad (*Alosa fallax fallax*, Lacepede, 1803) in the watershed of river Scheldt
Author :	Maas, J.; Stevens, M.; Breine, J.
Series :	Hydrobiologia, 602: 129-143
Year :	2008
Title :	Flora of County Waterford
Author :	Green, P.
Series :	The National Botanic Gardens of Ireland, Dublin
Year :	2010
Title :	Otter tracking study of Roaringwater Bay
Author :	De Jongh, A.; O'Neill, L.
Series :	Unpublished draft report to NPWS
Year :	2010
Title :	Addressing the conservation and rehabilitation of *Margaritifera margaritifera* populations in the Republic of Ireland within the framework of the habitats and species directive
Author :	Moorkens, E.
Series :	Journal of Conchology, 40: 339
Year :	2011
Title :	Comparison of field- and GIS-based assessments of barriers to Atlantic salmon migration: a case study in the Nore Catchment, Republic of Ireland
Author :	Gargan, P.G.; Roche, W.K.; Keane, S.; King, J.J.; Cullagh, A.; Mills, P.; O'Keeffe, J.
Series :	Journal of Applied Ichthyology, 27 (Suppl. 3): 66-72
Year :	2012
Title :	Rare and threatened bryophytes of Ireland
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	National Museums Northern Ireland
Year :	2013
Title :	Aspects of brook lamprey (*Lampetra planeri* Bloch) spawning in Irish waters
Author :	Rooney, S.M.; O'Gorman, N.M.; Green, F.; King, J.J.
Series :	Biology and Environment: Proceedings of the Royal Irish Academy, 113B(1): 13-25
Year :	2013
Title :	Management strategies for the protection of high status water bodies
Author :	Ní Chatháin, B.; Moorkens, E.; Irvine, K.
Series :	Strive Report Series No. 99. EPA, Wexford
Year :	2013
Title :	Interpretation manual of European Union habitats- Eur 28
Author :	European Commission- DG Environment
Series :	European Commission
Year :	2014
Title :	Assessing near-bed velocity in a recruiting population of the endangered freshwater pearl mussel (*Margaritifera margaritifera*) in Ireland
Author :	Moorkens, E.; Killeen, I.
Series :	Aquatic Conservation: Marine and Freshwater Ecosystems, 24(6): 853-862

Year :	2015
Title :	Water quality in Ireland 2010-2012
Author :	Bradley, C.; Byrne, C.; Craig, M.; Free, G.; Gallagher, T.; Kennedy, B.; Little, R.; Lucey, J.; Mannix, A.; McCreesh, P.; McDermott, G.; McGarrigle, M.; Ní Longphuirt, S.; O'Boyle, S.; Plant, C.; Tierney, D.; Trodd, W.; Webster, P.; Wilkes, R.; Wynne, C.
Series :	EPA, Wexford
Year :	2015
Title :	Behaviour of sea lamprey (*Petromyzon marinus* L.) at man-made obstacles during upriver spawning migration: use of telemetry to access efficacy of weir modifications for improved passage
Author :	Rooney, S.M.; Wightman, G.D.; O Conchuir, R.; King, J.J.
Series :	Biology and Environment: Proceedings of the Royal Irish Academy, 115B: 1-12
Year :	2015
Title :	River engineering works and lamprey ammocoetes; impacts, recovery, mitigation
Author :	King, J.J.; Wightman, G.D.; Hanna, G.; Gilligan, N.
Series :	Water and Environment Journal, 29: 482-488
Year :	2016
Title :	A narrative for conserving freshwater and wetland habitats in England
Author :	Mainstone, C.; Hall, R.; Diack, I.
Series :	Natural England Research Reports Number 064
Year :	2016
Title :	The Status of Irish Salmon Stocks in 2015 with Precautionary Catch Advice for 2016
Author :	SSCS (Standing Scientific Committee on Salmon)
Series :	Independent Scientific Report to Inland Fisheries Ireland
Year :	Undated
Title :	WFD111 (2a) Coarse resolution rapid-assessment methodology to assess obstacles to fish migration: Field manual level A assessment
Author :	SNIFFER (Scotland and Northern Ireland Forum for Environmental Research)
Series :	SNIFFER WFD111

Spatial data sources

Year :	Revision 2010
Title :	Saltmarsh Monitoring Project 2007-2008. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1330, 1410 (map 3)
Year :	Revision 2010
Title :	National Survey of Native Woodlands 2003-2008. Version 1
GIS Operations :	QIs selected; clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	91A0, 91E0 (maps 4 and 5)
Year :	Revision 2012
Title :	Margaritifera Sensitive Areas data
GIS Operations :	Relevant catchment boundaries identified. Expert opinion used as necessary to resolve any issues arising
Used For :	1029 (map 6)
Year :	2016
Title :	NPWS rare and threatened species database
GIS Operations :	Dataset created from spatial references in database records. Expert opinion used as necessary to resolve any issues arising
Used For :	1029, 1092 (maps 6 and 7)
Year :	2010
Title :	EPA WFD Waterbodies data
GIS Operations :	Creation of 20m buffer to river and stream centreline data. Dataset combined with derived OSi data for 1355 SSCO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (no map)
Year :	2005
Title :	OSi Discovery series vector data
GIS Operations :	Creation of 80m buffer on the marine side of high water mark (HWM); creation of 10m buffer on terrestrial side of HWM; combination of 80m and 10m HWM buffer datasets. Datasets combined with derived EPA WFD Waterbodies data for 1355 SSCO. Overlapping regions investigated and resolved; resulting dataset clipped to SAC boundary. Expert opinion used as necessary to resolve any issues arising
Used For :	1355 (no map)

Conservation Objectives for : Lower River Suir SAC [002137]

1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae)

To restore the favourable conservation condition of Atlantic salt meadows (Glauco-Puccinellietalia maritimae) in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession. For the sub-site (Little Island) and potential areas mapped: 33.43ha. See map 3	Based on data from the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). The sub-site Little Island (SMP site ID: SMP0052) that supports Atlantic Salt Meadows (ASM) was mapped during the SMP (4.11ha) and additional areas of potential ASM habitat (29.32ha) were identified from an examination of aerial photographs, giving a total estimated area of 33.43ha within Lower River Suir SAC. NB further unsurveyed areas may be present within the SAC. See the Lower River Suir SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes. See map 3 for known and potential distribution	Based on data from McCorry and Ryle (2009). Saltmarsh occurs on the River Suir estuary downstream of Waterford City in old flood meadows where the embankment is absent, or has been breached, and along the tidal stretches of some of the in-flowing channels below Little Island. NB further unsurveyed areas may be present within the SAC. See the coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Based on data from McCorry and Ryle (2009). Little Island saltmarsh contains a well-developed topography and large, deep creeks are present. See the coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Based on data from McCorry and Ryle (2009). Much of the shoreline along the Lower River Suir channel has been modified by embankments, infilling and drainage. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Based on data from McCorry and Ryle (2009). There are several saltmarsh communities present and zonation is moderately well-developed in the sub-site surveyed. The ASM transitions to grassland and freshwater habitats. This is typical of an estuary type saltmarsh with a significant freshwater influence. See the coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation within sward	Based on data from McCorry and Ryle (2009). As the sub-site is not grazed, the sward height is lush and rank in places. However, the overall sward structure is still quite variable. See the coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% of the area outside of creeks vegetated	Based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with typical species listed in McCorry and Ryle (2009)	See the coastal habitats supporting document for further details

Vegetation composition: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1% where it is known to occur	Based on data from McCorry and Ryle (2009). Common cordgrass (*Spartina anglica*) is present in the SAC, but swards are not a significant feature. See the coastal habitats supporting document for further details

REFERENCE DOCUMENT

1410 Mediterranean salt meadows (Juncetalia maritimi)

To restore the favourable conservation condition of Mediterranean salt meadows (Juncetalia maritimi) in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, including erosion and succession	Mediterranean Salt Meadows (MSM) habitat was not recorded in Lower River Suir SAC during the Saltmarsh Monitoring Project (SMP) (McCorry and Ryle, 2009). Thus the total area of the qualifying habitat in the SAC is unknown. An NPWS survey in the 1990s noted stands of sea rush (*Juncus maritimus*), indicative of MSM, on the saltmarsh at Grantstown (NPWS internal files), but the habitat was not recorded in the Little Island sub-site during the SMP in 2007 (McCorry and Ryle, 2009). NB unsurveyed areas may be present within the SAC. See the Lower River Suir SAC conservation objectives supporting document for coastal habitats for further details
Habitat distribution	Occurrence	No decline or change in habitat distribution, subject to natural processes	See note on area above. NB unsurveyed areas may be present within the SAC. See the coastal habitats supporting document for further details
Physical structure: sediment supply	Presence/absence of physical barriers	Maintain natural circulation of sediments and organic matter, without any physical obstructions	Attribute and target based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details
Physical structure: creeks and pans	Occurrence	Maintain creek and pan structure, subject to natural processes, including erosion and succession	Attribute and target based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details
Physical structure: flooding regime	Hectares flooded; frequency	Maintain natural tidal regime	Attribute and target based on data from McCorry and Ryle (2009). Mediterranean salt meadow habitat is found high up in the saltmarsh but requires occasional tidal inundation. See the coastal habitats supporting document for further details
Vegetation structure: zonation	Occurrence	Maintain the range of coastal habitats including transitional zones, subject to natural processes including erosion and succession	Attribute and target based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details
Vegetation structure: sward height	Centimetres	Maintain structural variation in the sward	Attribute and target based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details
Vegetation structure: vegetation cover	Percentage cover at a representative number of monitoring stops	Maintain more than 90% of the area outside of creeks vegetated	Attribute and target based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details
Vegetation composition: typical species and sub-communities	Percentage cover at a representative number of monitoring stops	Maintain range of sub-communities with characteristic species listed in McCorry and Ryle (2009)	See the coastal habitats supporting document for further details
Vegetation composition: negative indicator species - *Spartina anglica*	Hectares	No significant expansion of common cordgrass (*Spartina anglica*), with an annual spread of less than 1% where it is already known to occur	Attribute and target based on data from McCorry and Ryle (2009). See the coastal habitats supporting document for further details

Conservation Objectives for : Lower River Suir SAC [002137]

3260 Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation

To maintain the favourable conservation condition of Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Kilometres	Area stable or increasing, subject to natural processes	The description of habitat 3260 covers upland rivers with bryophytes and macroalgae to lowland depositing rivers with pondweeds and starworts. The selection of Lower River Suir SAC used this broad interpretation. Conservation objectives for habitat 3260 concentrate on the high conservation value sub-types, however, little is known of the habitat's distribution or its sub-types in Lower River Suir SAC. There is a large number of lowland and tidal rivers in the SAC, as well as faster-flowing tributaries. Note: rooted macrophytes should be absent or trace (<5% cover) in freshwater pearl mussel (*Margaritifera margaritifera*) habitat. The freshwater pearl mussel (1029) conservation objective takes precedence over this objective for habitat 3260 in the Clodiagh River (Portlaw) within this SAC, because the mussel requires environmental conditions close to natural background levels
Habitat distribution	Occurrence	No decline, subject to natural processes	Further study is needed of Irish sub-types and their conservation value to interpret the broad description of habitat 3260 (European Commission, 2013). As noted above, little is known about the distribution of the habitat and its sub-types in Lower River Suir SAC. The uncommon, protected opposite-leaved pondweed (*Groenlandia densa*) was recorded in the SAC from floodplain ditches of the Suir near Carrick-on-Suir and Clonmel, as well as the Clodiagh near Portlaw (Colgan and Scully, 1898; NPWS internal files). See NPWS (2012) for information on the requirements of opposite-leaved pondweed. There are no known records for rare or threatened bryophytes from the rivers in the SAC (Lockhart et al., 2012). The rivers in the SAC are mainly lowland, depositing and tidal, and are likely dominated by marginal and submerged higher plants. Some fast-flowing rivers also occur that should, naturally, be dominated by macroalgae and bryophytes, with limited submerged or emergent higher plants
Hydrological regime: river flow	Metres per second	Maintain appropriate hydrological regimes	High conservation value sub-types are associated with natural hydrology. A natural flow regime is required for both plant communities and channel geomorphology to be in favourable condition, exhibiting typical dynamics for the river type (Hatton-Ellis and Grieve, 2003). For many sub-types, high flows are required to maintain the substratum necessary for the characteristic species. Flow variation can be particularly important, with high and flood flows being critical to the hydromorphology. Other aspects of hydrology, such as tidal regime, are important for certain sub-types of the habitat. The rivers in the SAC vary from naturally flashy, through depositing to tidal reaches
Hydrological regime: groundwater discharge	Metres per second	Maintain appropriate hydrological regime	Even small groundwater contributions can significantly alter hydrochemistry, particularly where there is basic bedrock and/or subsoils. Freshwater seepages can be very important in tidal reaches

Hydrological regime: tidal influence	Daily water level fluctuations - metres	Maintain natural tidal regime	Opposite-leaved pondweed (*Groenlandia densa*) is typical of the tidal reaches of large Irish rivers, e.g. Suir, Slaney, Shannon and Blackwater (see Preston and Croft, 2001; Preston, 2003). This species is listed as Near Threatened (Wyse Jackson et al., 2016) and is protected on the Flora (Protection) Order, 2015 (Statutory Instrument No. 356 of 2015). Both the disturbance and substratum associated with the tidal regime may be important drivers
Substratum composition: particle size range	Millimetres	Maintain appropriate substratum particle size range, quantity and quality, subject to natural processes	Many of the high conservation value sub-types are dominated by coarse substrata, and it is likely that bedrock, boulders, cobbles and coarse gravels were naturally abundant in many tributaries in this SAC, particularly where the freshwater pearl mussel (*Margaritifera margaritifera*) occurred. Fine substrata are naturally abundant in depositing and tidal reaches. The size and distribution of particles are largely determined by the river flow. The chemical composition (particularly minerals and nutrients) of the substratum is also important. The quality of finer sediment particles is a notable driver of rooted plant communities. Note: increased fine sediment is contributing to the unfavourable status of the freshwater pearl mussel in the Clodiagh. See the freshwater pearl mussel (1029) conservation objective
Water quality	Various	Maintain appropriate water quality to support the natural structure and functioning of the habitat	The specific targets may vary among sub-types. Depositing and tidal stretches of rivers may, naturally, be more nutrient-rich and, therefore Water Framework Directive (WFD) good status may suffice in terms of nutrient and oxygenation standards, and EQRs (Ecological Quality Ratios) for macroinvertebrates and phytobenthos. Faster-flowing tributaries that are naturally dominated by bryophytes and macroalgae typically require WFD high status. High status targets apply to freshwater pearl mussel (*Margaritifera margaritifera*) habitat in the Clodiagh (see The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009 - S.I. No. 296 of 2009). See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009 (S.I. No. 272 of 2009), Environmental Protection Agency (EPA) river water quality reports (e.g. Bradley et al., 2015) and Ní Chatháin et al. (2013)
Typical species	Occurrence	Maintain typical species in good condition, including appropriate distribution and abundance	The sub-types of this habitat are poorly understood and their typical species have not yet been fully defined. The typical species may include higher plants, bryophytes, macroalgae and microalgae, and invertebrates. As noted above, the protected vascular plant species opposite-leaved pondweed (*Groenlandia densa*) is associated with rivers and floodplains in the SAC. The banks of the Suir, particularly its tidal stretches, support a notable population of the rare *Rumex crispus* subsp. *uliginosus* (Green, 2008)
Floodplain connectivity	Hectares	Maintain floodplain connectivity necessary to support the typical species and vegetation composition of the habitat	River connectivity with the floodplain is important for the functioning of this habitat. Channels with a naturally functioning floodplain are better able to maintain habitat and water quality (Hatton-Ellis and Grieve, 2003). Floodplain connectivity is particularly important in terms of sediment sorting and nutrient deposition. High conservation value rivers are intimately connected to floodplain habitats and function as important wildlife corridors, connecting otherwise isolated or fragmented habitats in the wider countryside (Hatton-Ellis and Grieve, 2003; Mainstone et al., 2016). Alluvial woodland (91E0) is an important feature of rivers in Lower River Suir SAC (see the conservation objective for 91E0)

Fringing habitats	Hectares	Maintain marginal fringing habitats that support the typical species and vegetation composition of the habitat	Riparian habitats (including those along lake shores), particularly natural/semi-natural woodlands and wetlands, are an integral part of the structure and functioning of river systems, even where they do not form part of a natural floodplain. Fringing habitats can contribute to the aquatic food web (e.g. allochthonous matter such as leaf fall), provide habitat (refuge and resources) for certain life-stages of fish, birds and aquatic invertebrates, assist in the settlement of fine suspended material, protect banks from erosion and contribute to nutrient cycling. Shade may also be important in suppressing algal growth in enriched rivers and moderating temperatures. Equally, fringing habitats are dependent on rivers/lakes, particularly their water levels, and support wetland communities and species of conservation concern. See Mainstone et al. (2016). Alluvial and riparian woodland is important for the rivers in Lower River Suir SAC

Conservation Objectives for : Lower River Suir SAC [002137]

6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

To maintain the favourable conservation condition of Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels habitat has not been mapped in detail for Lower River Suir SAC and thus the total area of the qualifying habitat in the SAC is unknown. The lowland type communities of the habitat are considered to occur in association with the various areas of alluvial forest (91E0) within the SAC, notably at Fiddown, below Carrick-on-Suir and at Tibberaghny Marshes. This habitat type would also be expected to occur in association with other woodland types in fringe areas along the river and with areas of open marsh or wet grassland within the SAC (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See notes on area above
Hydrological regime: Flooding depth/height of water table	Metres	Maintain appropriate hydrological regime	This habitat requires winter inundation, which results in deposition of naturally nutrient-rich sediment
Vegetation composition: positive indicator species	Number of species at a representative number of monitoring stops	At least three positive indicator species present	Attribute and target based on O'Neill et al. (2013), where the list of positive indicator species is also presented
Vegetation composition: positive indicator species	Percentage cover at a representative number of monitoring stops	Cover of positive indicator species at least 40%	Attribute and target based on O'Neill et al. (2013), where the list of positive indicator species is also presented
Vegetation composition: non-native species	Percentage cover at a representative number of monitoring stops	Cover of non-native species not more than 1%	Attribute and target based on O'Neill et al. (2013). The spread of Japanese knotweed (*Fallopia japonica*) is noted as a threat at Tibberaghny (NPWS internal files)
Vegetation composition: negative indicator species	Percentage at a representative number of monitoring stops	Cover of negative indicator species not more than 33%	Attribute and target based on O'Neill et al. (2013), where the list of negative indicator species is also presented
Vegetation composition: scrub, bracken and heath	Percentage at a representative number of monitoring stops	Cover of scrub, bracken (*Pteridium aquilinum*) and heath not more than 5%	Attribute and target based on O'Neill et al. (2013)
Vegetation structure: height	Height (centimetres) at a representative number of monitoring stops	Herb height at least 50cm	Attribute and target based on O'Neill et al. (2013)
Physical structure: bare soil	Percentage at a representative number of monitoring stops	Cover of bare soil not more than 10%	Attribute and target based on O'Neill et al. (2013)
Physical structure: grazing and disturbance	Square metres in local vicinity of a representative number of monitoring stops	Area of the habitat showing signs of serious grazing or disturbance less than 20m²	Attribute and target based on O'Neill et al. (2013)

Conservation Objectives for : Lower River Suir SAC [002137]

91A0 Old sessile oak woods with Ilex and Blechnum in the British Isles

To restore the favourable conservation condition of Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 29.3ha for sites surveyed. See map 4	Old sessile oak woods with *Ilex* and *Blechnum* were surveyed in Lower River Suir SAC by Perrin et al. (2008) as part of the National Survey of Native Woodlands (NSNW) at Lyranearla (NSNW site code: 1834) and Inchinsqullib Wood (NSNW site code: 1898). The area of old oak woodlands in the surveyed sites within the SAC is estimated to be 29.3ha. It is important to note that further unsurveyed areas are present within the SAC, including at Portlaw Wood within the Curraghmore Estate and other small pockets within the SAC (NPWS internal files). Map 4 shows the old oak woodlands surveyed by Perrin et al. (2008)
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 4	Distribution shown based on Perrin et al. (2008). NB further unsurveyed areas are present within this SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The target areas for individual woodlands aim to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). In some cases, topographical constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008) and NPWS internal files
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008) and NPWS internal files
Woodland structure: natural regeneration	Seedling: sapling: pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Oak (*Quercus petraea*) generally regenerates poorly. In suitable sites, ash (*Fraxinus excelsior*) can regenerate in large numbers although few seedlings reach pole size
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local distinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands (see Perrin and Daly, 2010), archaeological and geological features as well as red-listed and other rare or localised species. The rare lichen tree lungwort (*Lobaria pulmonaria*), an indicator of ancient woodlands, is found in Portlaw Wood (NPWS internal files)
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008) and NPWS internal files

Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including oak (*Quercus petraea*) and birch (*Betula pubescens*)	Species reported in Perrin et al. (2008) and NPWS internal files
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	Rhododendron (*Rhododendron ponticum*) infestation at Portlaw Wood is noted as being serious, as well as the occurrence of beech (*Fagus sylvatica*), sycamore (*Acer pseudoplatanus*) and silver fir (*Abies alba*) in the woodland (NPWS internal files). Beech was reported from Lyranearla (NSNW site code: 1834) by Perrin et al. (2008)

Conservation Objectives for : Lower River Suir SAC [002137]

91E0 Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)

To restore the favourable conservation condition of Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (Alno-Padion, Alnion incanae, Salicion albae)* in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes, at least 32.9ha for sites surveyed. See map 5	Alluvial forest was surveyed in Lower River Suir SAC by Perrin et al. (2008) as part of the National Survey of Native Woodlands (NSNW) at Fiddown (NSNW site code: 0022), Mountbolton (NSNW site code: 1823) and Ballycanvan Big (NSNW site code: 1839). Fiddown (0022) was also included in a national monitoring survey (O'Neill and Barron, 2013). The area of alluvial woodlands in the surveyed sites within the SAC is estimated to be 32.9ha. It is important to note that further unsurveyed areas of alluvial forest are present within the SAC, for example at islands below Carrick-on-Suir, at Shanbally (Coillte LIFE project site), Tibberaghny Marshes, along the lower stretches of the more westerly of the Suir tributaries and along both banks of the Suir as far east as the Dawn River (NPWS internal files). Map 5 shows the alluvial woodlands surveyed by Perrin et al. (2008)
Habitat distribution	Occurrence	No decline. Surveyed locations shown on map 5	Distribution shown based on Perrin et al. (2008). NB further unsurveyed areas are present within the SAC
Woodland size	Hectares	Area stable or increasing. Where topographically possible, "large" woods at least 25ha in size and "small" woods at least 3ha in size	The target areas for individual woodlands aim to reduce habitat fragmentation and benefit those species requiring 'deep' woodland conditions (Peterken, 2002). In some cases, topographical constraints may restrict expansion
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and well-developed herb layer	Described in Perrin et al. (2008) and NPWS internal files
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	Described in Perrin et al. (2008) and NPWS internal files
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Alder (*Alnus glutinosa*) and oak (*Quercus* spp.) tend to regenerate poorly. Ash (*Fraxinus excelsior*) often regenerates in large numbers although few seedlings reach pole size
Hydrological regime: flooding depth/height of water table	Metres	Appropriate hydrological regime necessary for maintenance of alluvial vegetation	Periodic flooding is essential to maintain alluvial woodlands along river floodplains, but not for woodland around springs/seepage areas
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter (greater than 20cm diameter in the case of alder (*Alnus glutinosa*))	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources

Woodland structure: indicators of local distinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands, archaeological and geological features as well as red-listed and other rare or localised species. Perrin and Daly (2010) identify the site Ballycanvan Big (NSNW site code: 1839) as being "possible ancient woodland"
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	Species reported in Perrin et al. (2008) and NPWS internal files
Vegetation composition: typical species	Occurrence	A variety of typical native species present, depending on woodland type, including alder (*Alnus glutinosa*), willows (*Salix* spp.), oak (*Quercus* spp.), ash (*Fraxinus excelsior*) and birch (*Betula pubescens*)	Species reported in Perrin et al. (2008) and NPWS internal files
Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	Norway spruce (*Picea abies*) and sycamore (*Acer pseudoplatanus*) occur at Shanbally (NPWS internal files). Spread of Japanese knotweed (*Fallopia japonica*) is a problem at Tibberaghny (NPWS internal files). Cherry laurel (*Prunus laurocerasus*) and rhododendron (*Rhododendron ponticum*) have been reported as occurring in part of Ballycanvan Big (NSNW site code: 1839) by Perrin et al. (2008), but not within the alluvial woodland

Conservation Objectives for : Lower River Suir SAC [002137]

91J0 Taxus baccata woods of the British Isles

To restore the favourable conservation condition of *Taxus baccata* woods of the British Isles* in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	*Taxus baccata* woods of the British Isles habitat has not been mapped in detail for Lower River Suir SAC and thus the total area of the qualifying habitat is unknown. Yew (*Taxus baccata*) woodland is known to occur at Cahir Park in an area of c.500m by 50m. Cahir Park was included in a national monitoring survey of yew woodland (Cross and Lynn, 2013). NB further unsurveyed areas may be present within the SAC
Habitat distribution	Occurrence	No decline	A narrow stand of yew woodland occurs along the steep western flank of a limestone knoll at Cahir Park within Lower River Suir SAC. See Cross and Lynn (2013) for further details. NB further unsurveyed areas may be present within the SAC
Woodland size	Hectares	Area stable or increasing	Yew (*Taxus baccata*) has been planted on deeper soil on top of the knoll at Cahir Park. If the transplants survive, the area of yew woodland will be considerably expanded. See Cross and Lynn (2013) for further details
Woodland structure: cover and height	Percentage and metres	Diverse structure with a relatively closed canopy containing mature trees; subcanopy layer with semi-mature trees and shrubs; and herb and bryophyte layer	See Perrin et al. (2008) and Cross and Lynn (2013) for further details
Woodland structure: community diversity and extent	Hectares	Maintain diversity and extent of community types	See Perrin et al. (2008) and Cross and Lynn (2013) for further details
Woodland structure: natural regeneration	Seedling:sapling:pole ratio	Seedlings, saplings and pole age-classes occur in adequate proportions to ensure survival of woodland canopy	Yew (*Taxus baccata*) regenerates poorly under its own canopy but can regenerate under a canopy of other species or in the open if the competition from the field layer is not too strong
Woodland structure: dead wood	m^3 per hectare; number per hectare	At least $30m^3$/ha of fallen timber greater than 10cm diameter; 30 snags/ha; both categories should include stems greater than 40cm diameter	Dead wood is a valuable resource and an integral part of a healthy, functioning woodland ecosystem
Woodland structure: veteran trees	Number per hectare	No decline	Mature and veteran trees are important habitats for bryophytes, lichens, saproxylic organisms and some bird species. Their retention is important to ensure continuity of habitats/niches and propagule sources
Woodland structure: indicators of local disctinctiveness	Occurrence	No decline	Includes ancient or long-established woodlands (see Perrin and Daly, 2010), archaeological and geological features as well as red-data and other rare or localised species
Vegetation composition: native tree cover	Percentage	No decline. Native tree cover not less than 95%	See Perrin et al. (2008) and Cross and Lynn (2013) for further details
Vegetation composition: typical species	Occurrence	A variety of typical native species present, including yew (*Taxus baccata*) and ash (*Fraxinus excelsior*)	See Perrin et al. (2008) and Cross and Lynn (2013) for further details

Vegetation composition: negative indicator species	Occurrence	Negative indicator species, particularly non-native invasive species, absent or under control	The most common invasive species in this woodland type is beech (*Fagus sylvatica*), although there is evidence to suggest that it actually facilitates regeneration of yew (*Taxus baccata*). Numerous exotic species, including cherry laurel (*Prunus laurocerasus*) in particular, have been reported from Cahir Park (Cross and Lynn, 2013)

Conservation Objectives for : Lower River Suir SAC [002137]

1029 Freshwater Pearl Mussel *Margaritifera margaritifera*

To restore the favourable conservation condition of Freshwater Pearl Mussel in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Kilometres	Restore distribution to 10.4km. See map 6	The conservation objective applies to the Clodiagh freshwater pearl mussel (*Margaritifera margaritifera*) population, which is listed on The European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. (S.I. 296 of 2009). Full baseline distribution and abundance mapping was conducted in 2006 (Ross, 2006). Mussel habitat is widespread in the Clodiagh, with mussels almost continually present in low numbers from downstream of Clonea to above Portlaw (Ross, 2006). Mussels were nowhere abundant; maximum density was 3 per square metre (Ross, 2006). The habitat is significantly below carrying-capacity. The distribution in the Clodiagh has contracted since the 1990s (Ross, 2006). The target is for the species to be sufficiently widespread to maintain itself on a long-term basis as a viable component of the Clodiagh system. See NPWS (2010) for further information
Population size	Number of adult mussels	Restore population to at least 10,000 adult mussels	Ross (2006) counted 1,206 mussels and estimated a total population of 2,412, concluding that, given the large areas of physically suitable habitat, a much larger population was previously present and a major population decline had occurred. Ross (2009) measured an 18.5% decline in mussel numbers between 2006 and 2009 at transect 1, indicating continued losses. Ross et al. (2017) recorded 'rapid and alarming' declines of 56-94% between 2006 and 2016 at five monitoring locations (67% decline overall). Moorkens (2010) estimated the population to be less than 10,000. The target of 10,000 is considered appropriate for a functional, self-sustaining population. NPWS (2013), in producing a national population estimate, assumed the Clodiagh population had declined at a rate of 3% per year. The target is for the species to be sufficiently abundant to maintain itself on a long-term basis as a viable component of the Clodiagh system
Population structure: recruitment	Percentage per size class	Restore to at least 20% of each population no more than 65mm in length; and at least 5% of each population no more than 30mm in length	Mussels ≤65mm are 'young mussels' and found buried in the substratum or beneath adult mussels. Mussels ≤30mm are 'juvenile mussels' and always buried in the substratum. See the European Communities Environmental Objectives (Freshwater Pearl Mussel) Regulations 2009. The Clodiagh failed both targets in 2006, 2009 and 2016 (Ross, 2006, 2009; NPWS, 2010; Ross et al., 2017). Ross (2006) found no juveniles, ≤65mm extremely uncommon, smallest individual was 45.4mm and 97% was >80mm. In 2009, the smallest mussel was 78mm and (based on Ross, 1988) 15-20 years old (Ross, 2009). The smallest of 21 mussels measured in 1986 was 48.6mm (Ross, 1988). NPWS (2010) concluded there had been no successful recruitment from 1986 to 2009. The Clodiagh population is considered to be unsustainable owing to lack of survival of juvenile and adult mussels. The target is for sufficient juvenile recruitment to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system

Population structure: adult mortality	Percentage	No more than 5% decline from previous number of live adults counted; dead shells less than 1% of the adult population and scattered in distribution	5% is considered the cut-off between the combined errors associated with natural fluctuations and sampling methods and evidence of true population decline. 1% of dead shells is considered to be indicative of natural losses. The Clodiagh failed both targets in 2009 (Ross, 2009; NPWS, 2010) and, as noted above, a major population decline has occurred (Ross, 2006; Ross et al., 2017), and is presumed to be on-going. In 2009, 1 transect and 1 delimited count were counted: T1 numbers had fallen from 27 in 2006 to 22, representing a 18.5% decline, while numbers were the same in C2. Seven dead shells were found among 23 live mussels at one location, indicating high mortality in parts of the Clodiagh. In 2016, 67 mussels were counted at five monitoring sites that had 205 mussels in 2006 (Ross et al., 2017). The target is for sufficient survival of adults to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system
Suitable habitat: extent	Kilometres	Restore suitable habitat in more than 8.8km in the Clodiagh system and any additional stretches necessary for salmonid spawning	Mussel habitat in the Clodiagh is known to occur from Clonea to Portlaw, and is sparsely occupied from c.630m downstream of Clonea to c.1.8km above Portlaw (Ross, 2006). Mussels were recorded at Portlaw as recently as the 1990s and downstream of Portlaw in the early 20th century. It is possible that some mussel habitat occurs upstream or downstream of the mapped stretches, but few mussels are likely to be found (Ross, 2006). The mussel habitat has been severely impacted for a significant period by sedimentation, other hydromorphological changes, organic pollution and eutrophication (NPWS, 2010). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system
Suitable habitat: condition	Kilometres	Restore condition of suitable habitat	The species' habitat is a combination of the area of 1) habitat adult and juvenile mussels can occupy; 2) spawning and nursery habitats host fish can occupy. Fish nursery and mussel habitat typically overlap. Fish spawning habitat is generally adjacent to mussel habitat, but may lie upstream of the generalised mussel distribution. Only spawning areas that regularly contribute juvenile fish to adult mussel habitat should be considered. Availability of mussel and fish habitat is determined by flow and substratum conditions. It is highly sensitive to hydromorphological changes, sedimentation and enrichment. Pressures throughout the catchment contribute to such impacts. Mussel habitat is widespread in the Clodiagh but in unfavourable condition owing to sedimentation, other hydro-morphological changes and nutrient enrichment. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system

Water quality: macroinvertebrate and phytobenthos (diatoms)	Ecological quality ratio (EQR)	Restore water quality - macroinvertebrates: EQR greater than 0.90 (Q4-5 or Q5); phytobenthos: EQR greater than 0.93	The EQRs correspond to high ecological status for these two Water Framework Directive biological quality elements. They represent high water quality with very low nutrient concentrations (oligotrophic conditions). In 2009, the habitat in the Clodiagh system failed the macroinvertebrate target, but passed the phytobenthos target (Morgan, 2009; Ní Chatháin, 2010; NPWS, 2010). Q values in the mussel habitat were Q3-Q4 (Morgan, 2009). There has been a gradual decline in quality at several main-channel sites since the late 1970s (Morgan, 2009). Sewage discharge at Clonea is impacting water quality downstream of Clonea Bridge (Ross, 2006; Morgan, 2009; Ní Chatháin, 2010; NPWS, 2010). See also The European Communities Environmental Objectives (Surface Waters) Regulations 2009. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system
Substratum quality: filamentous algae (macroalgae); macrophytes (rooted higher plants)	Percentage	Restore substratum quality - filamentous algae: absent or trace (less than 5%); macrophytes: absent or trace (less than 5%)	The Clodiagh failed the macrophyte target, but marginally passed the macroalgal target in 2009 (NPWS, 2010). Patches of abundant *Ranunculus* were recorded by all surveyors, with up to 40% cover in places (Morgan, 2009; Ross, 2009; Ní Chatháin, 2010; NPWS, 2010). Ross (2006) also recorded widespread and, in places, abundant (up to 80%) *Ranunculus*. Algae were generally absent in 2009, however up to 10% *Cladophora* cover was recorded downstream of Clonea Bridge (Ní Chatháin, 2010; NPWS, 2010), where sewage fungus had previously been recorded (Ross, 2006). Algae were also sparse in 2006 and 2016 (Ross, 2006; Ross et al., 2017). Tree shade may be supressing plant growth over much of the mussel habitat (Ross et al., 2017). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system
Substratum quality: sediment	Occurrence	Restore substratum quality - stable cobble and gravel substrate with very little fine material; no artificially elevated levels of fine sediment	The Clodiagh failed the target for the Sub-basin Management Plan in 2009 and 2016, with strong silt plumes recorded in mussel habitat (Ross, 2009; NPWS, 2010; Ross et al., 2017). Ross et al. (2017) recorded extremely heavy silt plumes at every site, even in fast riffles. Ross (2006) recorded significant siltation of the mussel habitat and observed river bank erosion and collapse, and livestock entry to the river. Silt in the Clodiagh is providing a rooting medium for macrophytes. Sufficient survival of juvenile and adult mussels is being prevented by the poor condition of the river substratum. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system
Substratum quality: oxygen availability	Redox potential	Restore to no more than 20% decline from water column to 5cm depth in substrate	Differences in redox potential between the water column and the substrate correlate with differences in oxygen levels. Juvenile mussels require full oxygenation while buried in gravel. In suitable habitat, there should be very little loss of redox potential between the water column and underlying gravels. Average redox was very poor, 23-28% at four sites monitored in 2016, only three of the 40 measurements was <20% (Ross et al., 2017). The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system

Hydrological regime: flow variability	Metres per second	Maintain appropriate hydrological regime	The availability of suitable freshwater pearl mussel habitat is largely determined by flow (catchment geology being the other key factor). To restore the habitat for the species, flow variability over the annual cycle must be such that: 1) high flows can wash fine sediments from the substratum; 2) high flows are not artificially increased so as to cause excessive scour of mussel habitat; 3) low flows do not exacerbate the deposition of fine sediment or growth of algae/macrophytes and 4) low flows do not cause stress to mussels in terms of exposure, water temperatures, food availability or aspects of the reproductive cycle; see Moorkens and Killeen (2014). Groundwater inflow to the substratum contributes to water-cycling. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of Clodiagh system
Host fish	Number	Maintain sufficient juvenile salmonids to host glochidial larvae	Salmonid fish are host to the larval stage of the freshwater pearl mussel and essential to completion of the life cycle. 0+ and 1+ fish are typically used, both because of habitat overlaps and the development of immunity with age in fish. Fish presence is sufficient, as higher fish density and biomass is indicative of enriched conditions in mussel rivers. Geist et al. (2006) found that higher densities of host fish coincided with eutrophication, poor substrate quality for mussels and a lack of mussel recruitment, while significantly lower host fish density and biomass were associated with high juvenile mussel numbers. Fish movements must be such that 0+ fish remain in the mussel habitat until their 1+ summer. No fish stocking should occur within the mussel habitat, nor any works that may change the salmonid balance or residency time. No glochidia were found on young Clodiagh fish in May 2009, although six trout and 38 salmon were caught (Johnston, 2009; NPWS, 2010)
Fringing habitat: area and condition	Hectares	Restore the area and condition of fringing habitats necessary to support the population	Riparian habitats, including those along lake fringes, particularly natural/semi-natural woodlands and wetlands, even where they do not form part of a natural floodplain, are an integral part of the structure and functioning of river systems. Fringing habitats aid in the settlement of fine suspended matter, protect banks from erosion, contribute to nutrient cycling and to the aquatic food web (e.g. allochthonous matter such as leaf fall) and provide habitat for life-stages of fish, birds and aquatic invertebrates. Shade may also be important in suppressing algal and macrophyte growth in enriched rivers (e.g. along parts of the Clodiagh) and moderating temperatures. Equally, fringing habitats are dependent on rivers/lakes, particularly their water levels, and support wetland communities and species of conservation concern. The target is for sufficient habitat in favourable condition to allow the species to maintain itself on a long-term basis as a viable component of the Clodiagh system

REFERENCE DOCUMENT

1092 White-clawed Crayfish *Austropotamobius pallipes*

To maintain the favourable conservation condition of White-clawed Crayfish in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Occurrence	No reduction from baseline. See map 7	White-clawed crayfish (*Austropotamobius pallipes*) occurs extensively on the River Suir and on many of its tributaries. On the River Suir main channel, the species has been recorded on almost the entire length of non-tidal river from the most upstream point at Cabragh, near Thurles, to downstream of Kilsheelan. It is also present on the following tributaries: Anner and Clashawley, Clodiagh and Owenbeg, Multeen, Tar, Nier, and Clodiagh Lower
Population structure: recruitment	Occurrence of juveniles and females with eggs	Juveniles and/or females with eggs in all occupied tributaries	See Reynolds et al. (2010) for further details
Negative indicator species	Occurrence	No alien crayfish species	Alien crayfish species are identified as a major direct threat to this species and as a disease vector. Ireland is currently free of non-native invasive crayfish species. See Reynolds (1998) for further details
Disease	Occurrence	No instances of disease	Disease is identified as a major threat and crayfish plague has occurred in Ireland even in the absence of alien vectors. Disease can, in some circumstances, be introduced through contaminated equipment and water in the absence of vector species. See Reynolds (1998) for further details
Water quality	EPA Q value	At least Q3-4 at all sites sampled by EPA	Target taken from Demers and Reynolds (2002). Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)
Habitat quality: heterogeneity	Occurrence of positive habitat features	No reduction in habitat heterogeneity or habitat quality	Crayfish need high habitat heterogeneity. Larger crayfish must have stones to hide under, or an earthen bank in which to burrow. Hatchlings shelter in vegetation, gravel and among fine tree roots. Smaller crayfish are typically found among weed and debris in shallow water. Larger juveniles in particular may also be found among cobbles and detritus, such as leaf litter. These conditions must be available on the whole length of occupied habitat

Conservation Objectives for : Lower River Suir SAC [002137]

1095 Sea Lamprey *Petromyzon marinus*

To restore the favourable conservation condition of Sea Lamprey in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	Percentage of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	Artificial barriers can block or cause difficulties to lampreys' upstream migration, thereby limiting the species to lower stretches and restricting access to spawning areas (Gargan et al., 2011; Rooney et al., 2015). Float-over surveys by Inland Fisheries Ireland (IFI) point to little success of sea lamprey adults in passing the weirs in Clonmel in Lower River Suir SAC. Modifications to these weirs would facilitate upstream passage of sea lamprey. IFI has embarked on a programme of detailed survey of major barriers in SAC catchments, in the context of sea lamprey passage, using the SNIFFER (Scotland and Northern Ireland Forum for Environmental Research) WFDIII methodology
Population structure of juveniles	Number of age/size groups	At least three age/size groups present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007). A catchment-wide larval lamprey survey was completed by IFI in 2016. The data are currently being analysed
Juvenile density in fine sediment	Juveniles/m²	Juvenile density at least 1/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003). A catchment-wide larval lamprey survey was completed by IFI in 2016. The data are currently being analysed
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by IFI. Lampreys spawn in clean gravels. Substantial areas of suitable spawning habitat are available from Cahir to Carrick-on-Suir, but access to areas upstream of Clonmel is problematic
Availability of juvenile habitat	Number of positive sites in 3rd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Silting habitat is essential for larval lamprey and they can be severely impacted by sediment removal. Recovery can be rapid and newly-created habitat can be rapidly colonised (King et al., 2015). However, it is vital that such sedimenting habitats are retained

Conservation Objectives for : Lower River Suir SAC [002137]

1096 Brook Lamprey *Lampetra planeri*

To restore the favourable conservation condition of Brook Lamprey in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage of river accessible	Access to all water courses down to first order streams	Artificial barriers can block or cause difficulties to lampreys' migration both up- and downstream, thereby possibly limiting species to specific stretches, restricting access to spawning areas and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of brook/river lamprey present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007). It is impossible to distinguish between brook and river lamprey juveniles in the field (Gardiner, 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis. A catchment-wide larval lamprey survey was completed by Inland Fisheries Ireland (IFI) in 2016. The data are currently being analysed
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by IFI. Brook lampreys spawn in clean gravels where they excavate shallow nests and can spawn communally (Rooney et al., 2013)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Silting habitat is essential for larval lamprey and they can be severely impacted by sediment removal. Recovery can be rapid and newly-created habitat can be rapidly colonised (King et al., 2015). However, it is vital that such sedimenting habitats are retained

Conservation Objectives for : Lower River Suir SAC [002137]

1099 River Lamprey *Lampetra fluviatilis*

To restore the favourable conservation condition of River Lamprey in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage of river accessible	Access to all water courses down to first order streams	Artificial barriers can block river lampreys' migration both up- and downstream, thereby limiting species to specific stretches, restricting access to spawning areas and creating genetically isolated populations (Espanhol et al., 2007)
Population structure of juveniles	Number of age/size groups	At least three age/size groups of river/brook lamprey present	Attribute and target based on data from Harvey and Cowx (2003) and O'Connor (2007). It is impossible to distinguish between river and brook lamprey juveniles in the field (Gardiner, 2003), hence they are considered together in this target
Juvenile density in fine sediment	Juveniles/m²	Mean catchment juvenile density of brook/river lamprey at least 2/m²	Juveniles burrow in areas of fine sediment in still water. Attribute and target based on data from Harvey and Cowx (2003) who state 10/m² in optimal conditions and more than 2/m² on a catchment basis. A catchment-wide larval lamprey survey was completed by Inland Fisheries Ireland (IFI) in 2016. The data are currently being analysed
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning beds	Attribute and target based on spawning bed mapping by Inland Fisheries Ireland (IFI). River lampreys spawn in clean gravels where thay excavate shallow nests and can spawn communally in numbers (Rooney et al., 2013)
Availability of juvenile habitat	Number of positive sites in 2nd order channels (and greater), downstream of spawning areas	More than 50% of sample sites positive	Silting habitat is essential for larval lamprey and they can be severely impacted by sediment removal. Recovery can be rapid and newly-created habitat can be rapidly colonised (King et al., 2015). However, it is vital that such sedimenting habitats are retained

REFERENCE DOCUMENT

1103 Twaite Shad *Alosa fallax fallax*

To restore the favourable conservation condition of Twaite Shad in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	Percentage of river accessible	Greater than 75% of main stem length of rivers accessible from estuary	In some catchments, artificial barriers block twaite shads' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
Population structure: age classes	Number of age classes	More than one age class present	
Extent and distribution of spawning habitat	m² and occurrence	No decline in extent and distribution of spawning habitats	
Water quality: oxygen levels	Milligrams per litre	No lower than 5mg/l	Attribute and target based on Maas et al. (2008)
Spawning habitat quality: Filamentous algae; macrophytes; sediment	Occurrence	Maintain stable gravel substrate with very little fine material, free of filamentous algal (macroalgae) growth and macrophyte (rooted higher plants) growth	See Maitland and Hatton-Ellis (2003) for further information

Conservation Objectives for : Lower River Suir SAC [002137]

1106 Salmon *Salmo salar*

To restore the favourable conservation condition of Atlantic Salmon in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution: extent of anadromy	Percentage of river accessible	100% of river channels down to second order accessible from estuary	Artificial barriers block salmons' upstream migration, thereby limiting species to lower stretches and restricting access to spawning areas
Adult spawning fish	Number	Conservation limit (CL) for each system consistently exceeded	A conservation limit (CL) is defined by the North Atlantic Salmon Conservation Organisation (NASCO) as "the spawning stock level that produces long-term average maximum sustainable yield as derived from the adult to adult stock and recruitment relationship". The target is based on the Standing Scientific Committee on Salmon (SSCS) annual model output of CL attainment levels. See SSCS (2016). Attainment of CL estimates are derived from direct counts of adults (rod catch, fish counter) or indirectly by fry abundance counts. The Suir is currently below CL, meeting 79% of CL
Salmon fry abundance	Number of fry/5 minutes electrofishing	Maintain or exceed 0+ fry mean catchment-wide abundance threshold value. Currently set at 17 salmon fry/5 minutes sampling	The target is the threshold value for rivers currently exceeding their conservation limit (CL). The average electrofishing value for the Suir in 2016 was 10.2 salmon fry, which is below the 17 fry target
Out-migrating smolt abundance	Number	No significant decline	Smolt abundance can be negatively affected by a number of impacts such as estuarine pollution, predation and sea lice (*Lepeophtheirus salmonis*)
Number and distribution of redds	Number and occurrence	No decline in number and distribution of spawning redds due to anthropogenic causes	Salmon spawn in clean gravels. Artificial barriers are generally not currently preventing salmon from accessing suitable spawning habitat in Lower River Suir SAC
Water quality	EPA Q value	At least Q4 at all sites sampled by EPA	Q values based on triennial water quality surveys carried out by the Environmental Protection Agency (EPA)

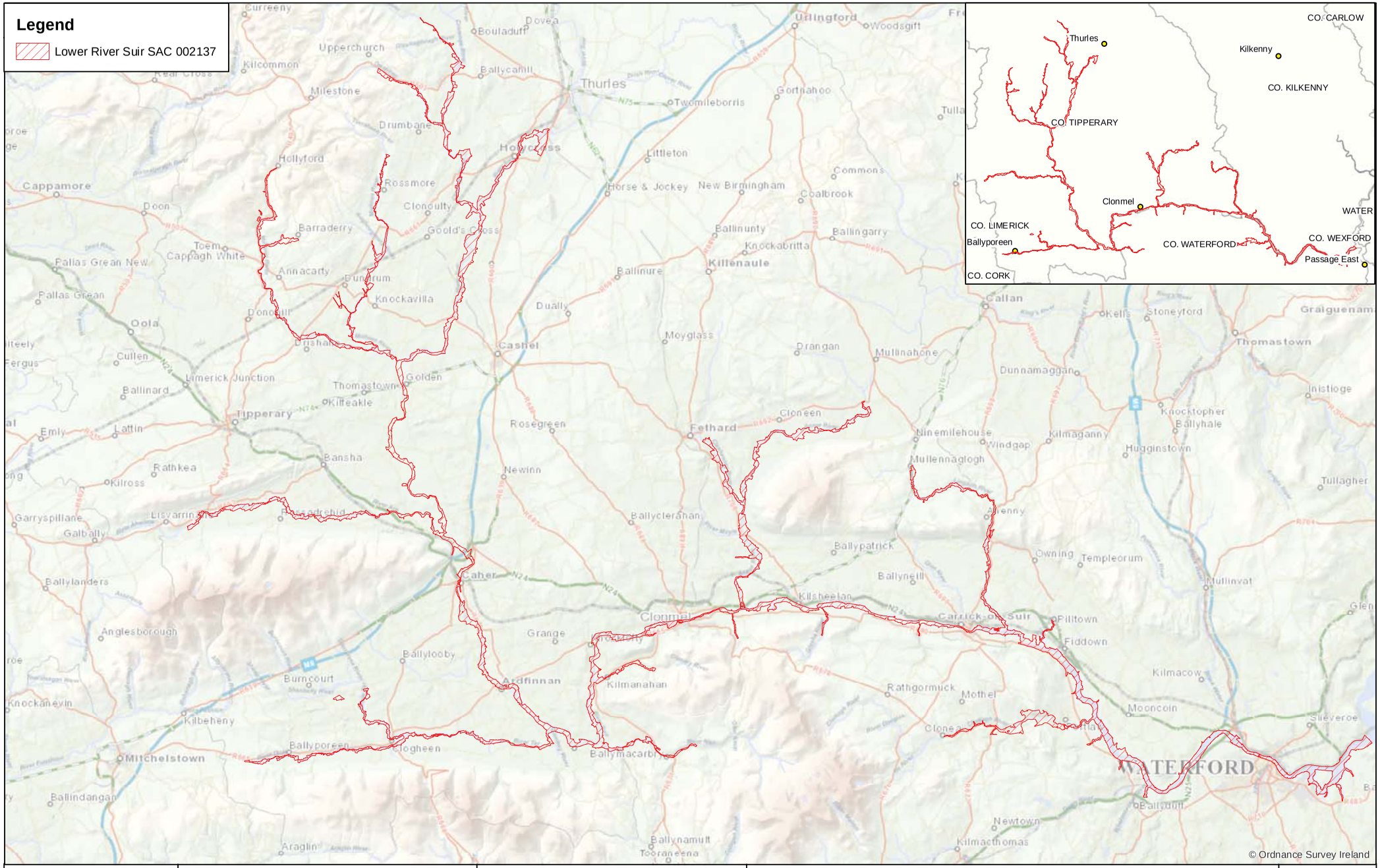
REFERENCE DOCUMENT

Conservation Objectives for : Lower River Suir SAC [002137]

1355 Otter *Lutra lutra*

To maintain the favourable conservation condition of Otter in Lower River Suir SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Percentage positive survey sites	No significant decline	Measure based on standard otter survey technique. Favourable Conservation Status (FCS) target, based on 1980/81 survey findings, is 88% in SACs. Current range is estimated at 93.6% (Reid et al. 2013)
Extent of terrestrial habitat	Hectares	No significant decline. Area mapped and calculated as 116.17ha above high water mark (HWM) and 726.61ha along river banks	No field survey. Areas mapped to include 10m terrestrial buffer along shoreline (above HWM and along river banks) identified as critical for otters (NPWS, 2007)
Extent of marine habitat	Hectares	No significant decline. Area mapped and calculated as 712.27ha	No field survey. Area mapped based on evidence that otters tend to forage within 80m of the shoreline (HWM) (Kruuk, 2006; NPWS, 2007)
Extent of freshwater (river) habitat	Kilometres	No significant decline. Length mapped and calculated as 382.31km	No field survey. River length calculated on the basis that otters will utilise freshwater habitats from estuary to headwaters (Chapman and Chapman, 1982)
Couching sites and holts	Number	No significant decline	Otters need lying up areas throughout their territory where they are secure from disturbance (Kruuk and Moorhouse, 1991; Kruuk, 2006)
Fish biomass available	Kilograms	No significant decline	Broad diet that varies locally and seasonally, but dominated by fish, in particular salmonids, eels and sticklebacks in freshwater (Bailey and Rochford, 2006; Reid et al., 2013) and wrasse and rockling in coastal waters (Kingston et al., 1999)
Barriers to connectivity	Number	No significant increase	Otters will regularly commute across stretches of open water up to 500m e.g. between the mainland and an island; between two islands; across an estuary (De Jongh and O'Neill, 2010). It is important that such commuting routes are not obstructed



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Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 1:
LOWER RIVER SUIR SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE: SAC 002137; version 3.
CO. WATERFORD, CO. LIMERICK,
CO.TIPPERARY, CO. KILKENNY

0 3 6 9 12 15 km

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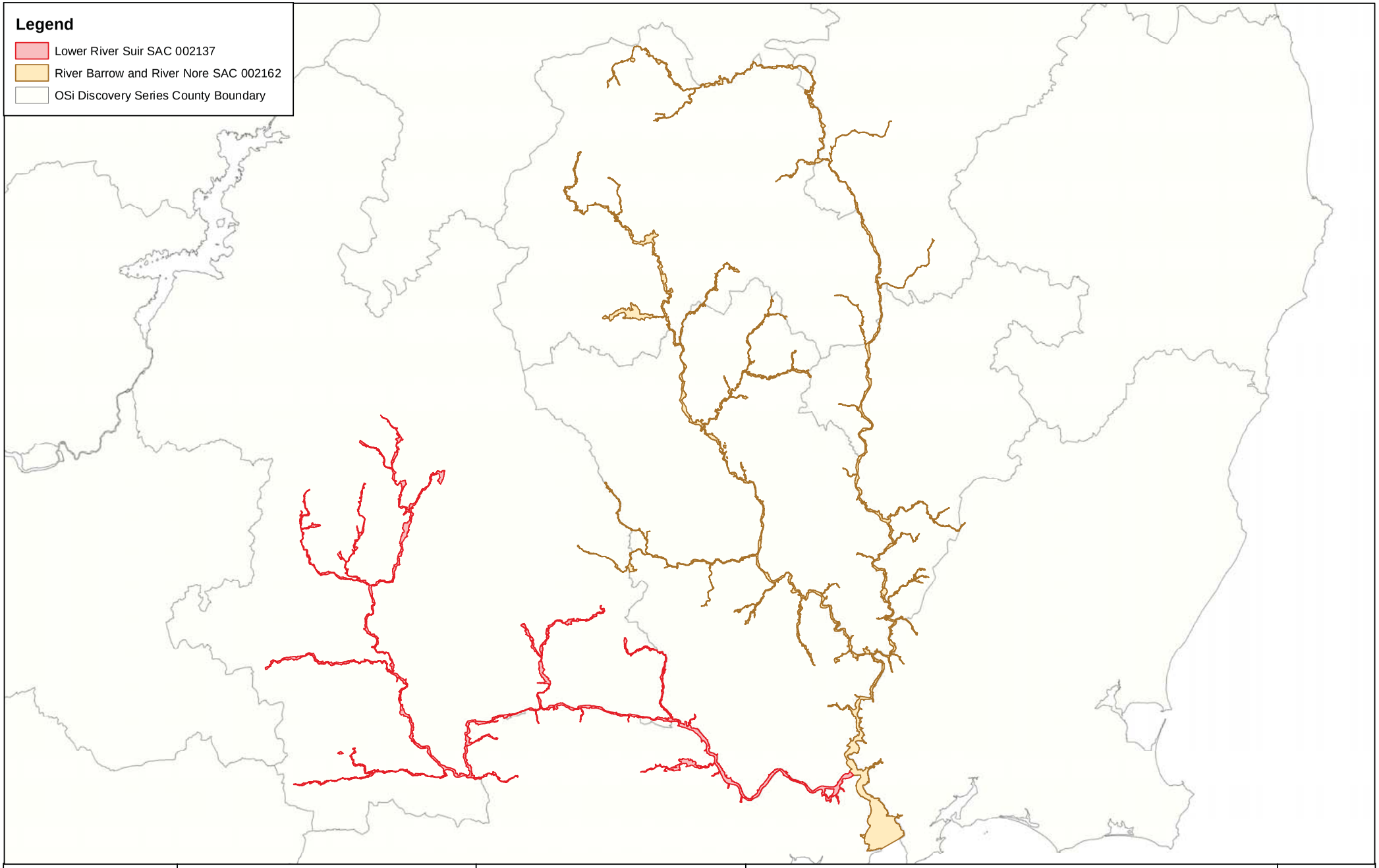
N

Map Version 1
Date: Oct 2016

REFERENCE DOCUMENT



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MAP 2:
LOWER RIVER SUIR SAC
CONSERVATION OBJECTIVES
ADJOINING DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

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SAC 002137; version 3. SAC 002162; version 3.01
CO. WATERFORD, CO. LIMERICK, CO.TIPPERARY, CO. KILKENNY

0 6 12 18 24 30 km

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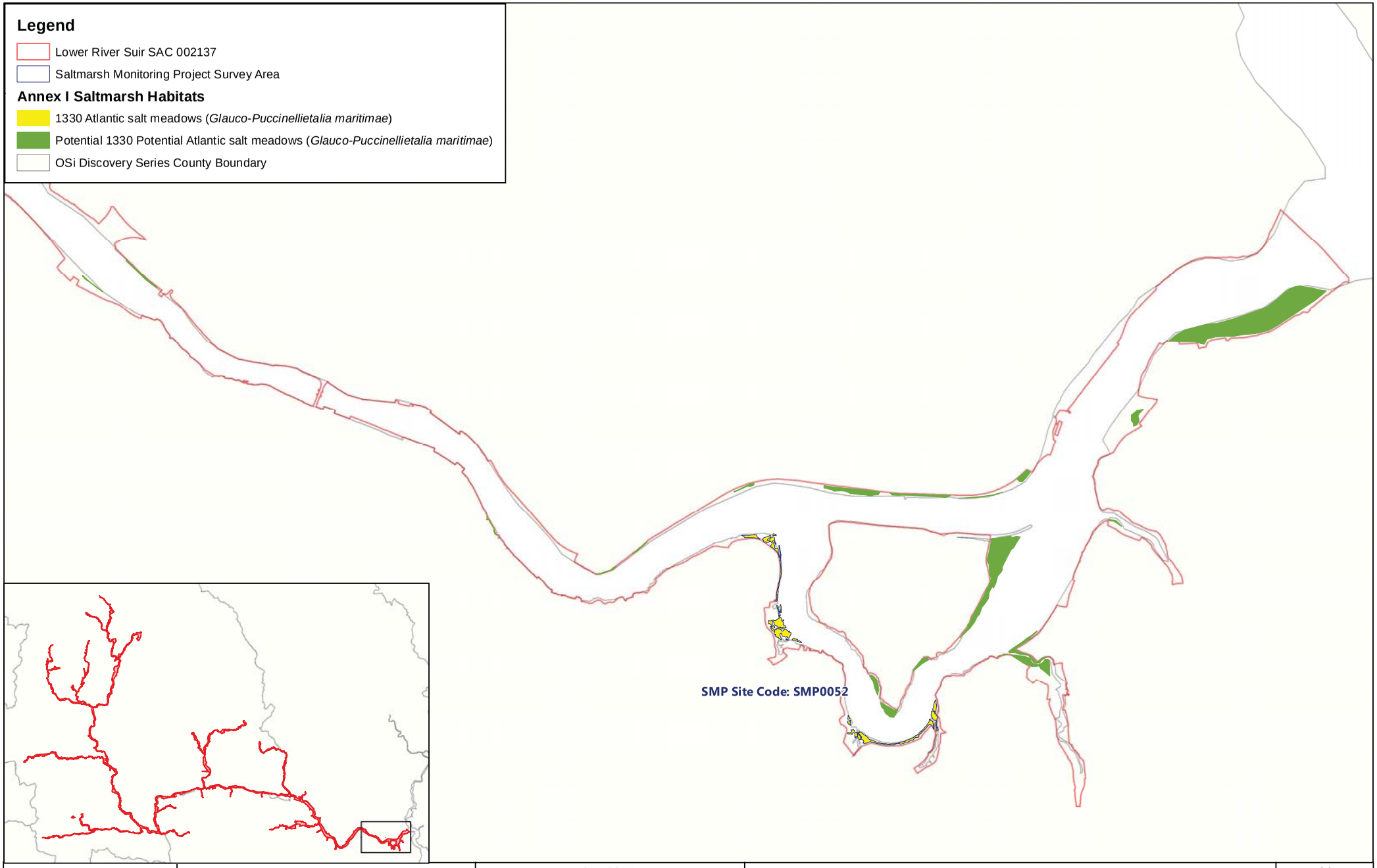
Map Version 1
Date: Oct 2016

REFERENCE DOCUMENT



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MAP 3:
LOWER RIVER SUIR SAC
CONSERVATION OBJECTIVES
SALTMARSH HABITATS

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002137; version 3.
CO. WATERFORD, CO. LIMERICK, CO.TIPPERARY, CO. KILKENNY

0 0.3 0.6 0.9 1.2 1.5 km

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Date: Oct 2016

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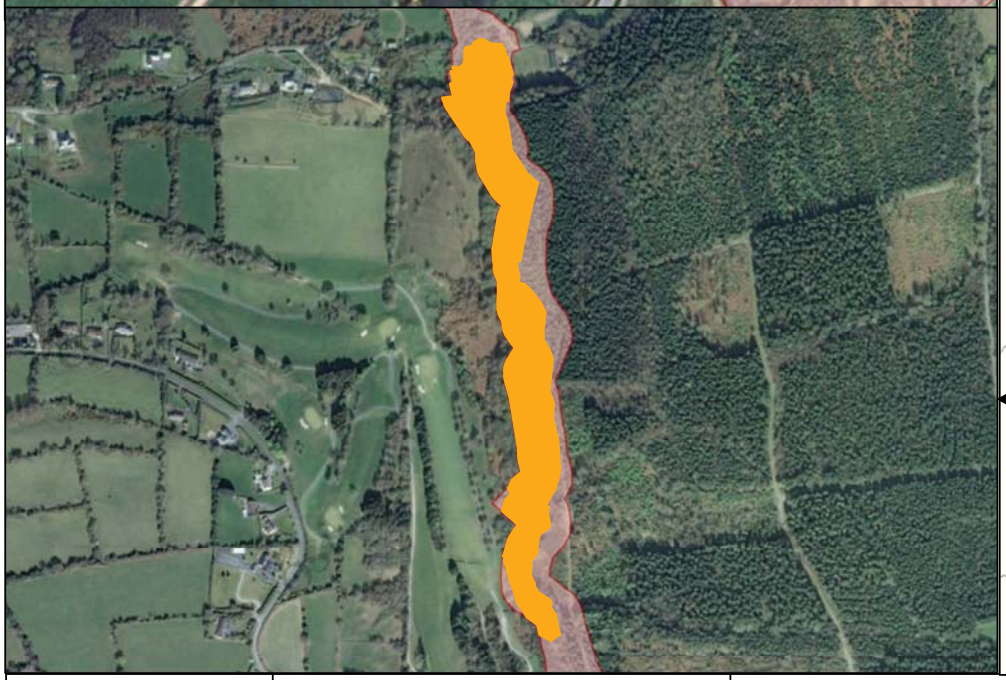

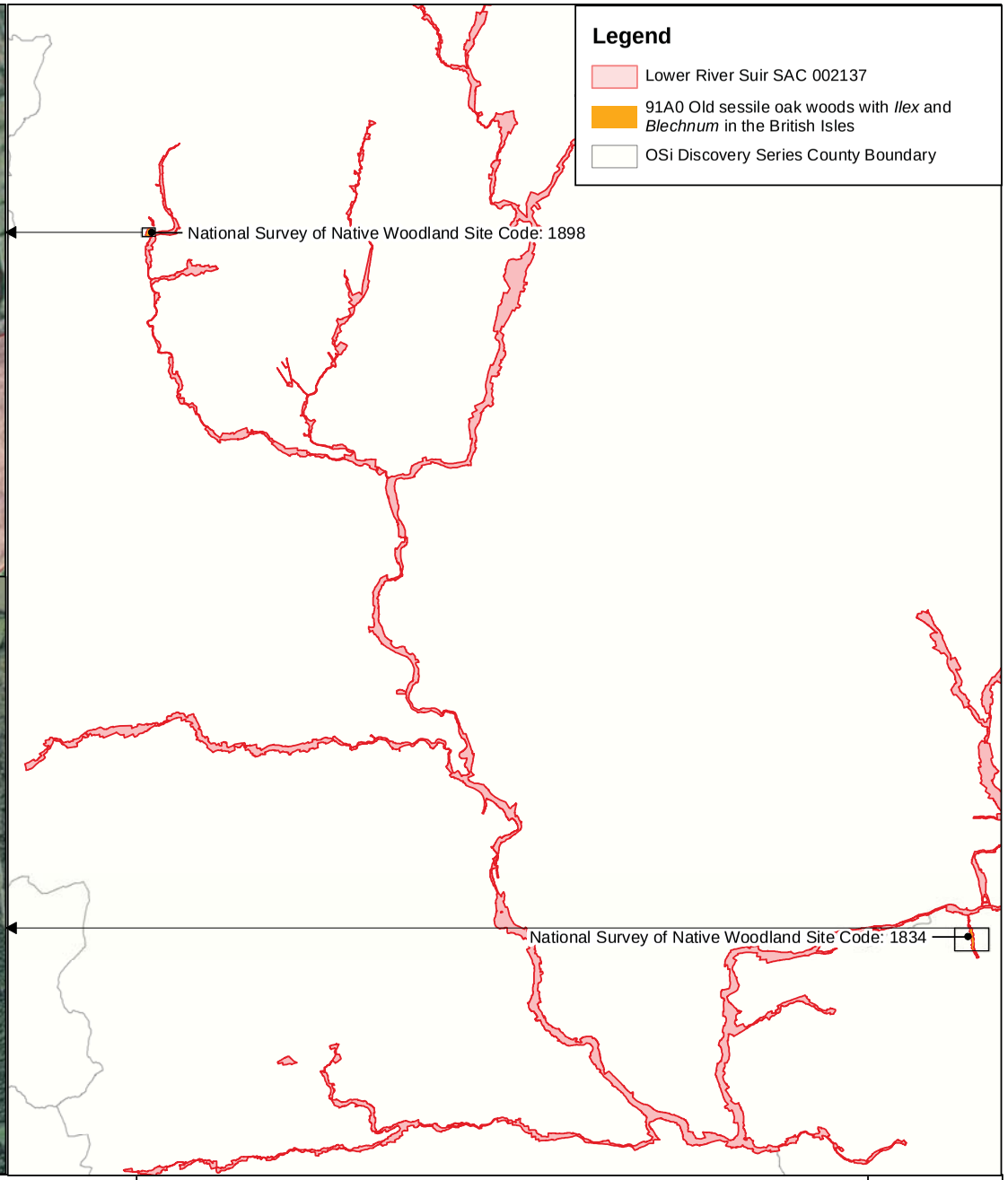

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MAP 4:
LOWER RIVER SUIR SAC
CONSERVATION OBJECTIVES
OLD SESSILE OAK WOODLAND

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
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0 0.035 0.07 0.105 0.14 0.175 km

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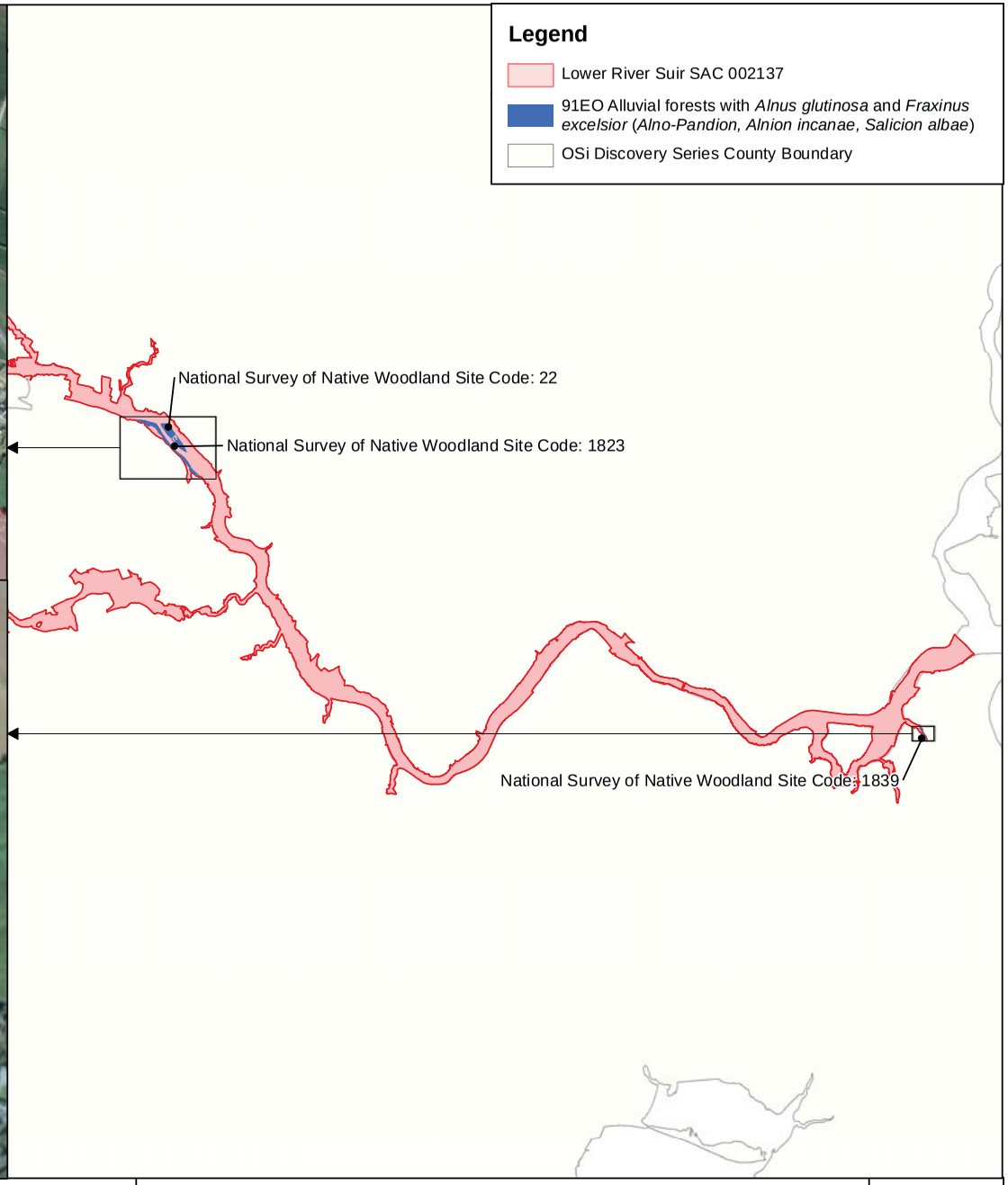
Map Version 1
Date: Oct 2016



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MAP 5:
LOWER RIVER SUIR SAC
CONSERVATION OBJECTIVES
ALLUVIAL WOODLAND

Map to be read in conjunction with the NPWS Conservation Objectives Document.

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0 0.15 0.3 0.45 0.6 0.75 km

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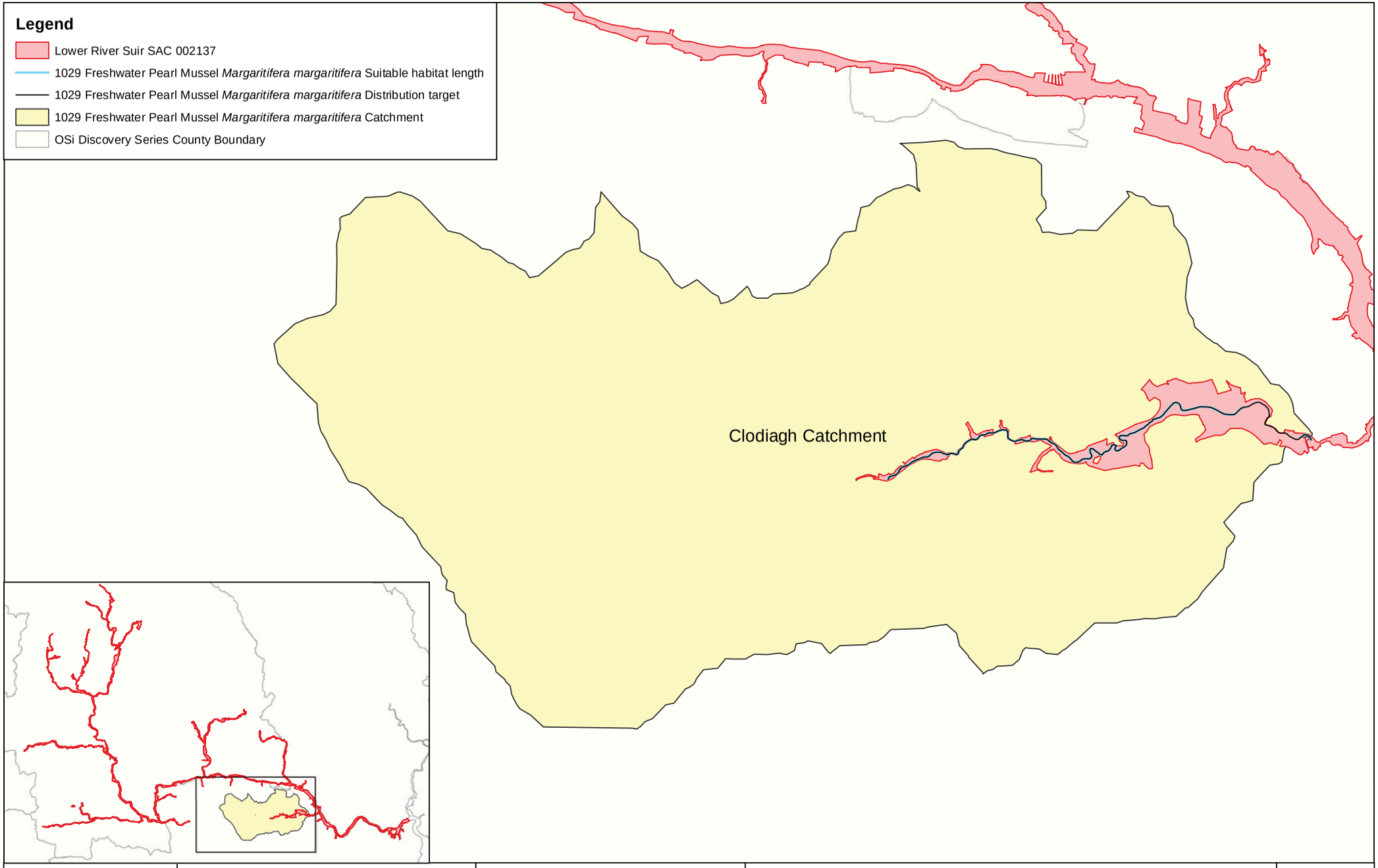
Date: Oct 2016



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MAP 6:
LOWER RIVER SUIR SAC
CONSERVATION OBJECTIVES
FRESHWATER PEARL MUSSEL -
MARGARITIFERA MARGARITIFERA

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002137; version 3.
CO. WATERFORD, CO. LIMERICK, CO.TIPPERARY, CO. KILKENNY

0 0.8 1.6 2.4 3.2 4 km

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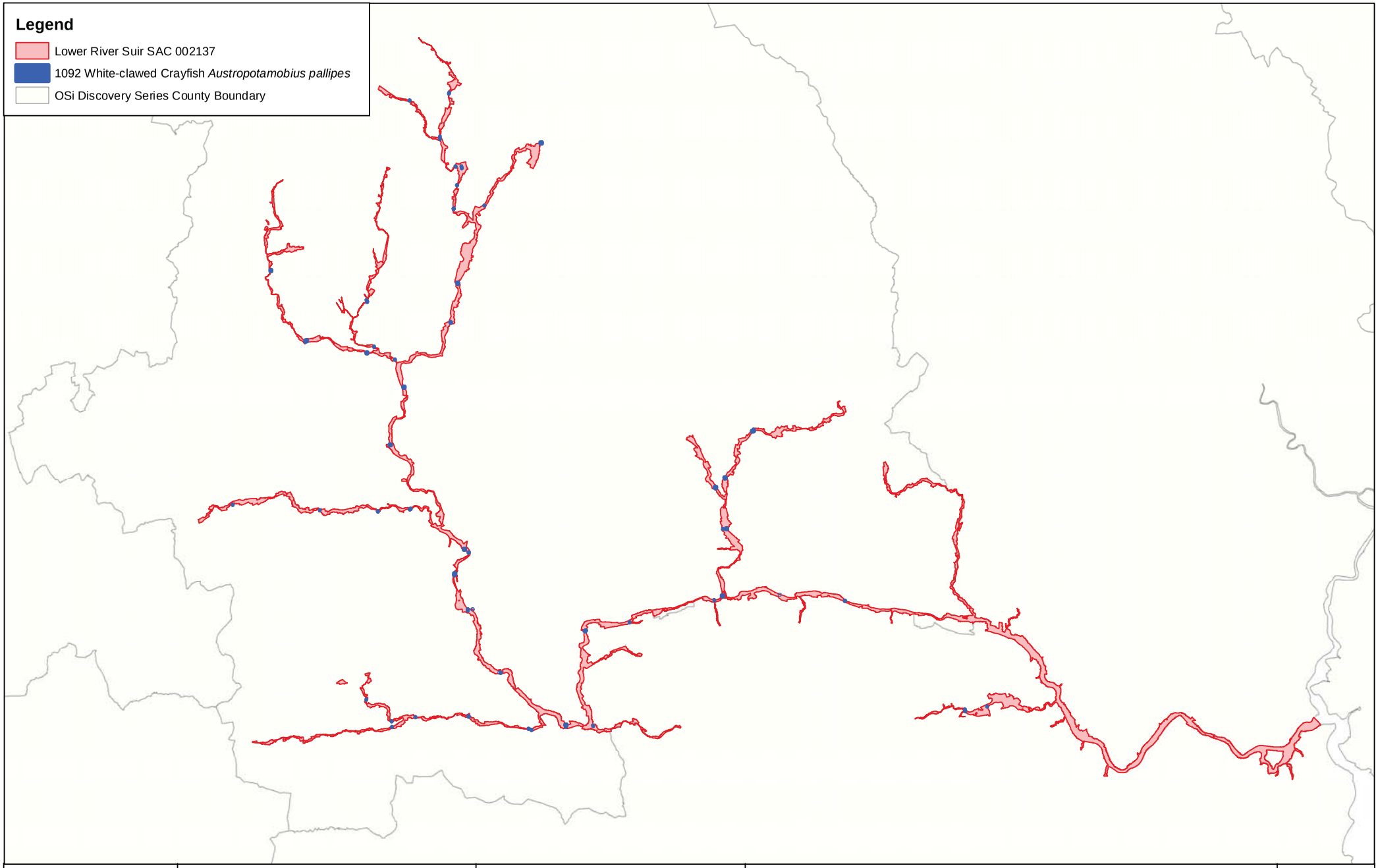

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MAP 7:
LOWER RIVER SUIR SAC
CONSERVATION OBJECTIVES
WHITE-CLAWED CRAYFISH

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002137; version 3.
CO. WATERFORD, CO. LIMERICK, CO.TIPPERARY, CO. KILKENNY

0 3 6 9 12 15 km

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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas

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Date: Oct 2016

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National Parks and Wildlife Service

Conservation Objectives Series

Philipston Marsh SAC 001847

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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

001847	Philipston Marsh SAC
7140	Transition mires and quaking bogs

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	1992
Title :	A report on the wetland vegetation of the Mulkear River catchment, Cos Limerick and Tipperary
Author :	Lockhart, N.D.
Series :	Unpublished report to NPWS
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2013
Title :	Conservation status assessments for three fen habitat types - 7230, 7210 and 7140
Author :	Kimberley, S.
Series :	Unpublished report to NPWS
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS

Other References

Year :	2004
Title :	Common Standards Monitoring guidance for lowland wetland habitats
Author :	JNCC
Series :	Joint Nature Conservation Committee, Peterborough
Year :	2011
Title :	Review and revision of empirical critical loads and dose-response relationships. Proceedings of an expert workshop, Noordwijkerhout, 23-25 June 2010
Author :	Bobbink, R.; Hettelingh, J.P.
Series :	RIVM report 680359002, Coordination Centre for Effects, National Institute for Public Health and the Environment (RIVM)

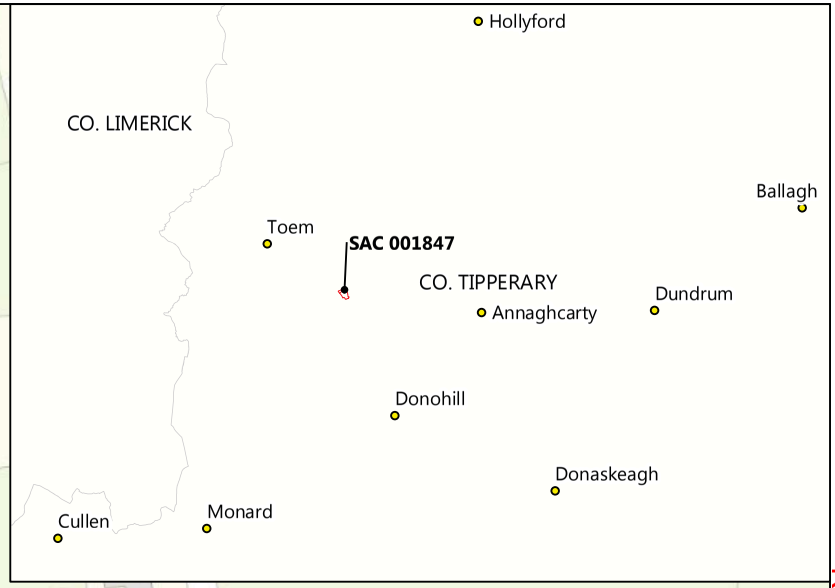
Conservation Objectives for : Philipston Marsh SAC [001847]

7140 Transition mires and quaking bogs

To maintain the favourable conservation condition of Transition mires and quaking bogs in Philipston Marsh SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Transition mires and quaking bogs has not been mapped in detail for Philipston Marsh SAC and thus the total area of the qualifying habitat in the SAC is unknown. Philipston Marsh SAC supports an important, though small, example of transition mire in the Mulkear River catchment, a region in which the habitat is rare. It occurs as a distinct habitat within the SAC and also in mosaic with alkaline fen and in association with reed swamp and ombrotrophic vegetation (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See the notes on Habitat area above
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil pH and nutrient status within natural ranges	Relevant nutrients and their natural ranges are yet to be defined. However, nitrogen deposition is noted as being relevant to this habitat in NPWS (2013). See also Bobbink and Hettelingh (2011)
Ecosystem function: peat formation	Percentage cover of peat-forming vegetation and water table levels	Maintain active peat formation, where appropriate	In order for peat to form, water levels need to be slightly below or above the soil surface for c.90% of the time
Ecosystem function: hydrology - water levels	Centimetres; duration of water levels	Maintain appropriate water levels necessary to support the natural structure and functioning of the habitat	Maintenance of a permanently high water level, remaining close to the peat surface all year, with water level fluctuations within natural ranges, is required for this wetland habitat. See Kimberley (2013)
Ecosystem function: hydrology - flow patterns	Flow direction	Maintain appropriate topography and water movement regime necessary to support the natural structure and functioning of the habitat	Maintenance, both within and surrounding the habitat, of topography and flow patterns within natural ranges is essential in order to ensure the hydrological integrity of this wetland habitat. A calcareous spring at the base of a gentle slope, close to the eastern boundary, flushes the southern part of the SAC with calcarous groundwater (Lockhart, 1992; NPWS internal files)
Ecosystem function: water quality	Water chemistry measures	Maintain appropriate water quality to support the natural structure and functioning of the habitat	The surface water conditions necessary to maintain transition mires range from acidic to slightly base-rich. The vegetation typically has intimate mixtures of species considered to be acidophile and others considered calciphile. In other cases, these intermediate properties may reflect the actual process of succession, as peat accumulates in groundwater-fed fen or open water to produce rainwater-fed bog isolated from groundwater influence. The calcareous nature of the spring in the SAC is due to the extensive limestone aquifer within the region (NPWS internal files)
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The entire diversity of transition mire vegetation communities in this SAC is unknown. Information on vegetation communities associated with this habitat in the uplands is presented in Perrin et al. (2014)

Vegetation composition: typical vascular plants and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Maintain adequate cover of typical vascular plant and bryophyte species	For lists of typical plant species see the Article 17 conservation status assessment for transition mires and quaking bogs (NPWS, 2013) and the fen habitats supporting document (Kimberley, 2013). See also Perrin et al. (2014) and JNCC (2004). In this SAC, typical vascular plant species recorded in the habitat include lesser tussock-sedge (*Carex diandra*), common sedge (*C. nigra*), bottle sedge (*C. rostrata*), bogbean (*Menyanthes trifoliata*) and marsh lousewort (*Pedicularis palustris*). Bryophytes recorded in the habitat in the SAC include *Campylium stellatum, Scorpidium revolvens, Ctenidium molluscum, Fissidens adianthoides, Philonotis calcarea* and *Palustriella commutata* (Lockhart, 1992; NPWS internal files)
Vegetation composition: native negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Native negative indicator species at insignificant levels	Negative indicators include species not characteristic of the habitat and species indicative of undesirable impacts such as overgrazing, undergrazing, nutrient enrichment, agricultural improvement or impacts on hydrology. Native negative indicator species that could suggest drying out include ling (*Calluna vulgaris*) and birch (*Betula pubescens*)
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Non-native species can be invasive and have deleterious effects on native vegetation. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances. Giant hogweed (*Heracleum mantegazzianum*) has been recorded in the SAC (NPWS internal files)
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014). Drainage can result in loss of characteristic species and transition to drier habitats
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground not more than 10%	Attribute and target based on Perrin et al. (2014). Disturbance can include hoof marks, wallows, human foot prints, vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion for peatlands
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat; maintain features of local distinctiveness, subject to natural processes	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016). Species found in the habitat in the SAC that are regionally uncommon include broad-leaved cottongrass (*Eriophorum latifolium*), marsh helleborine (*Epipactis palustris*) and fen bedstraw (*Galium uliginosum*). The bryophytes listed above are largely confined to Philipston Marsh SAC within the Mulkear River catchment (Lockhart, 1992; NPWS internal files)



REFERENCE DOCUMENT

Legend

Philipston Marsh SAC 001847

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An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

MAP 1:
PHILIPSTON MARSH SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 001847; version 3.01. CO. TIPPERARY

0 20 40 60 80 Meters

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059216. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

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Map Version 1
Date: Aug 2017

Conservation objectives for Ratty River Cave SAC [002316]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	Description
8310	Caves not open to the public

* denotes a priority habitat

Code	Common Name	Scientific Name
1303	Lesser Horseshoe Bat	*Rhinolophus hipposideros*

Citation: *NPWS (2018) Conservation objectives for Ratty River Cave SAC [002316]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

River Shannon and River Fergus Estuaries SPA 004077

An Roinn
Ealaíon, Oidhreachta agus Gaeltachta
Department of
Arts, Heritage and the Gaeltacht

National Parks and Wildlife Service,
Department of Arts, Heritage and the Gaeltacht,

7 Ely Place, Dublin 2, Ireland.

Web: www.npws.ie
E-mail: nature.conservation@ahg.gov.ie

Citation:
NPWS (2012) Conservation Objectives: River Shannon and River Fergus Estuaries SPA 004077. Version 1.0. National Parks and Wildlife Service, Department of Arts, Heritage and the Gaeltacht.

Series Editors: Rebecca Jeffrey & Naomi Kingston
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

REFERENCE DOCUMENT

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

004077 River Shannon and River Fergus Estuaries SPA

A017	Cormorant *Phalacrocorax carbo*	breeding + wintering
A038	Whooper Swan *Cygnus cygnus*	wintering
A046	Light-bellied Brent Goose *Branta bernicla hrota*	wintering
A048	Shelduck *Tadorna tadorna*	wintering
A050	Wigeon *Anas penelope*	wintering
A052	Teal *Anas crecca*	wintering
A054	Pintail *Anas acuta*	wintering
A056	Shoveler *Anas clypeata*	wintering
A062	Scaup *Aythya marila*	wintering
A137	Ringed Plover *Charadrius hiaticula*	wintering
A140	Golden Plover *Pluvialis apricaria*	wintering
A141	Grey Plover *Pluvialis squatarola*	wintering
A142	Lapwing *Vanellus vanellus*	wintering
A143	Knot *Calidris canutus*	wintering
A149	Dunlin *Calidris alpina*	wintering
A156	Black-tailed Godwit *Limosa limosa*	wintering
A157	Bar-tailed Godwit *Limosa lapponica*	wintering
A160	Curlew *Numenius arquata*	wintering
A162	Redshank *Tringa totanus*	wintering
A164	Greenshank *Tringa nebularia*	wintering
A179	Black-headed Gull *Chroicocephalus ridibundus*	wintering
A999	Wetlands	

Please note that this SPA overlaps with Lower River Shannon SAC (002165). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping site as appropriate.

Supporting documents, relevant reports & publications (listed by date)

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

Title:	BirdLife International Seabird Ecology and Foraging Range Database
Year:	2012
Author:	BirdLife International
Series:	http://seabird.wikispaces.com

Title:	Seabird Monitoring Programme (SMP) Database
Year:	2012
Author:	JNCC
Series:	http://jncc.defra.gov.uk/smp/Default.aspx

Title:	River Shannon and River Fergus Estuaries SPA (004077). Conservation objectives supporting document. [Version 1]
Year:	2012
Author:	NPWS
Series:	Unpublished Report to NPWS

Title:	Seabird Populations of Britain and Ireland
Year:	2004
Author:	Mitchell, P.I.; Newton, S.F.; Ratcliffe, N.; Dunn, T.E.
Series:	Poyser, London

Title:	Seabird monitoring handbook for Britain and Ireland: a compilation of methods for survey and monitoring of breeding seabirds.
Year:	1995
Author:	Walsh, P.; Halley, D.J.; Harris, M.P.; del Nevo, A.; Sim, I.M.W.; Tasker, M.L.
Series:	JNCC, Peterborough

REFERENCE DOCUMENT

A017 Cormorant *Phalacrocorax carbo*

To maintain the favourable conservation condition of Cormorant in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Breeding population abundance: apparently occupied nests (AONs)	Number	No significant decline	This attribute applies to breeding cormorant. Measure based on standard survey methods (see Walsh et al., 1995). Mitchell et al. (2004) provides summary population information. The Seabird Monitoring Programme (SMP) online database (JNCC, 2012) provides population data for this species
Productivity rate	Mean number	No significant decline	This attribute applies to breeding cormorant. Measure based on standard survey methods (see Walsh et al., 1995). The Seabird Monitoring Programme (SMP) online database (JNCC, 2012) provides population data for this species
Distribution: breeding colonies	Number; location; area (hectares)	No significant decline	This attribute applies to breeding cormorant. Cormorant colonies are usually sited on flat or rocky islets or sea stack tops, less often on cliffs but they can also nest in trees (Walsh et al., 1995)
Prey biomass available	Kilogrammes	No significant decline	This attribute applies to breeding cormorant. Key prey items: fish (mostly benthic), some crustaceans. Key habitats: populations use sandy areas, rocky and vegetated substrate. Foraging range: max. 50km, mean max. 31.67km, mean 8.46km (BirdLife International Seabird Database (Birdlife International, 2012))
Barriers to connectivity	Number; location; shape; area (hectares)	No significant increase	This attribute applies to breeding cormorant. Seabird species can make extensive use of the marine waters adjacent to their breeding colonies. Foraging range: max. 50km, mean max. 31.67km, mean 8.46km (BirdLife International Seabird Database (Birdlife International, 2012))
Disturbance at the breeding site	Level of impact	Human activities should occur at levels that do not adversely affect the breeding cormorant population	This attribute applies to breeding cormorant. Cormorant colonies are usually sited on flat or rocky islets or sea stack tops, less often on cliffs but they can also nest in trees (Walsh et al., 1995)
Population trend	Percentage change	Long term population trend stable or increasing	This attribute applies to non-breeding cormorant. Waterbird population trends are presented in part four of the conservation objectives supporting document

REFERENCE DOCUMENT

A017 Cormorant *Phalacrocorax carbo*

To maintain the favourable conservation condition of Cormorant in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by cormorant other than that occurring from natural patterns of variation	This attribute applies to non-breeding cormorant. As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A038 Whooper Swan *Cygnus cygnus*

To maintain the favourable conservation condition of Whooper Swan in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by whooper swan other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A046 Light-bellied Brent Goose *Branta bernicla hrota*

To maintain the favourable conservation condition of Light-bellied Brent Goose in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by light-bellied brent goose other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A048 Shelduck *Tadorna tadorna*

To maintain the favourable conservation condition of Shelduck in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by shelduck other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A050 Wigeon *Anas penelope*

To maintain the favourable conservation condition of Wigeon in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by wigeon other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A052 Teal *Anas crecca*

To maintain the favourable conservation condition of Teal in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by teal other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A054 Pintail *Anas acuta*

To maintain the favourable conservation condition of Pintail in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by pintail other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A056 Shoveler *Anas clypeata*

To maintain the favourable conservation condition of Shoveler in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by shoveler other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A062 Scaup *Aythya marila*

To maintain the favourable conservation condition of Scaup in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by scaup other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A137 Ringed Plover *Charadrius hiaticula*

To maintain the favourable conservation condition of Ringed Plover in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by ringed plover other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A140 Golden Plover *Pluvialis apricaria*

To maintain the favourable conservation condition of Golden Plover in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by golden plover other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A141 Grey Plover *Pluvialis squatarola*

To maintain the favourable conservation condition of Grey Plover in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by grey plover other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A142 Lapwing *Vanellus vanellus*

To maintain the favourable conservation condition of Lapwing in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by lapwing other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A143 Knot *Calidris canutus*

To maintain the favourable conservation condition of Knot in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by knot other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A149 Dunlin *Calidris alpina*

To maintain the favourable conservation condition of Dunlin in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by dunlin other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A156 Black-tailed Godwit *Limosa limosa*

To maintain the favourable conservation condition of Black-tailed Godwit in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by black-tailed godwit other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A157 Bar-tailed Godwit *Limosa lapponica*

To maintain the favourable conservation condition of Bar-tailed Godwit in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by bar-tailed godwit other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A160 Curlew *Numenius arquata*

To maintain the favourable conservation condition of Curlew in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by curlew other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A162 Redshank *Tringa totanus*

To maintain the favourable conservation condition of Redshank in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by redshank other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A164 Greenshank *Tringa nebularia*

To maintain the favourable conservation condition of Greenshank in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by greenshank other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A179 Black-headed Gull *Chroicocephalus ridibundus*

To maintain the favourable conservation condition of Black-headed Gull in the River Shannon and River Fergus Estuaries SPA, which is defined by the following list of attributes and targets:

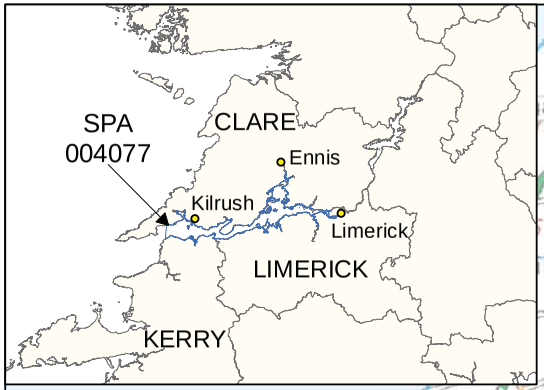
Attribute	Measure	Target	Notes
Population trend	Percentage change	Long term population trend stable or increasing	Waterbird population trends are presented in part four of the conservation objectives supporting document
Distribution	Range, timing and intensity of use of areas	There should be no significant decrease in the range, timing or intensity of use of areas by black-headed gull other than that occurring from natural patterns of variation	As determined by regular low tide and other waterbird surveys. Waterbird distribution from the 2010/2011 waterbird survey programme is discussed in part five of the conservation objectives supporting document

REFERENCE DOCUMENT

A999 Wetlands

To maintain the favourable conservation condition of the wetland habitat in the River Shannon and River Fergus Estuaries SPA as a resource for the regularly-occurring migratory waterbirds that utilise it. This is defined by the following attribute and target:

Attribute	Measure	Target	Notes
Wetland habitat area	hectares	The permanent area occupied by the wetland habitat should be stable and not significantly less than the area of 32,261ha, other than that occurring from natural patterns of variation	The wetland habitat area was estimated as 32,261ha using OSi data and relevant orthophotographs. For further information see part three of the conservation objectives supporting document



REFERENCE DOCUMENT

Legend

SPA 004077

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 1:
RIVER SHANNON AND RIVER FERGUS ESTUARIES
CONSERVATION OBJECTIVES
SPA DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

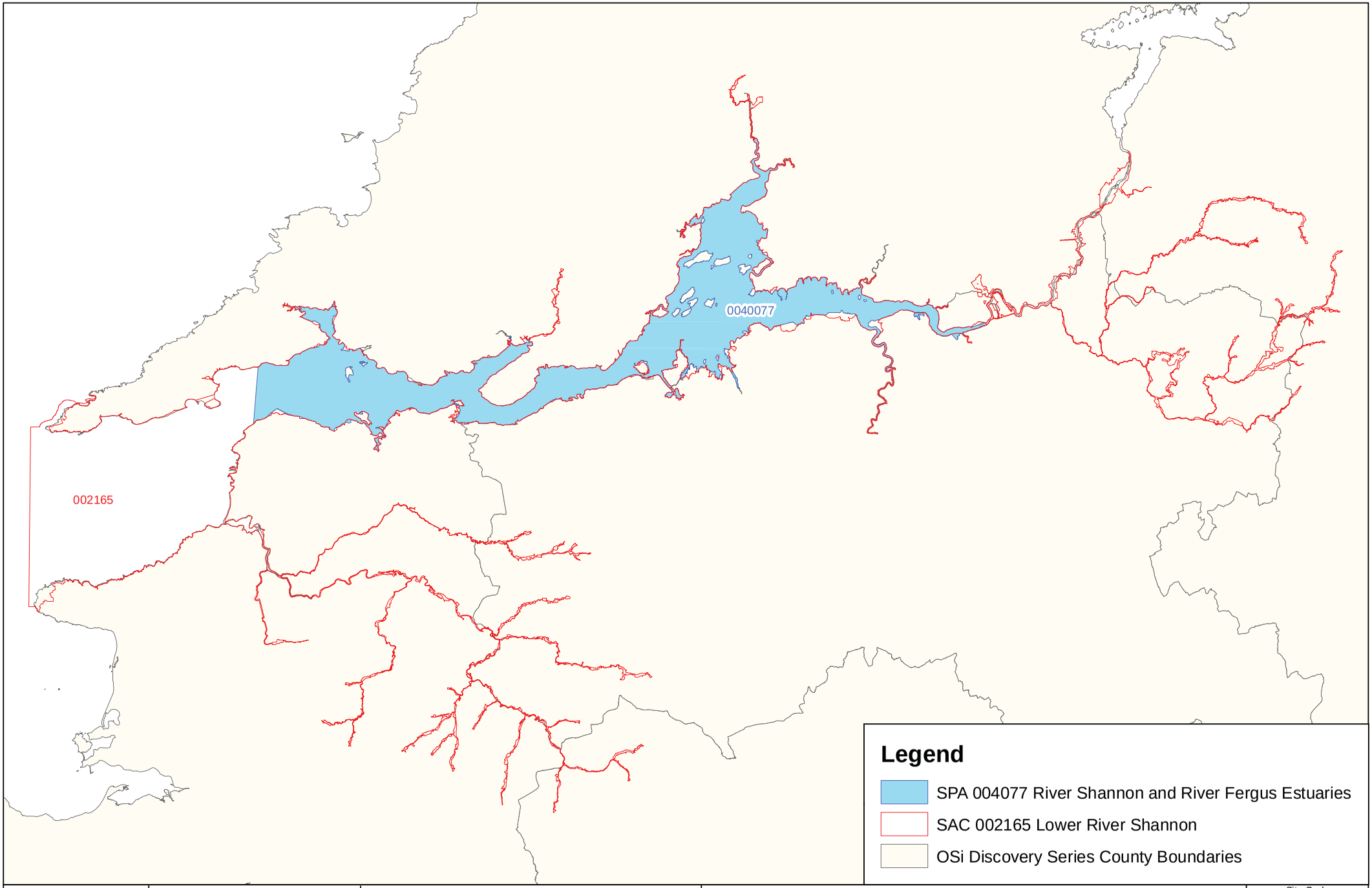
0 2 4 6 8 10 km

N

Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).

Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059208)

Site Code
SPA 004077
Version: CL 1.03 / LI 1.03 / KE 1.02
Map Version 1
Date: May 2012



Legend

- SPA 004077 River Shannon and River Fergus Estuaries
- SAC 002165 Lower River Shannon
- OSi Discovery Series County Boundaries

An Roinn Ealaíon, Oidhreachta agus Gaeltachta
Department of Arts, Heritage and the Gaeltacht

MAP 2:
RIVER SHANNON AND RIVER FERGUS ESTUARIES
CONSERVATION OBJECTIVES
ADJOINING / OVERLAPPING
DESIGNATIONS

Map to be read in conjunction with the NPWS Conservation Objectives SPA Document.

0 5 10 15 20 km

N

Boundaries of designated areas are subject to revision. Reproduced from Ordnance Survey material by permission of the Government (Permit number EN 0059208).

Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Macasamhail d'ábhar na Suirbhéarachta Ordonáis le chead ón Rialtas (Ceadunas Uimh. EN 0059208)

Site Code
SPA 004077
Version: CL 1.03 / LI 1.03 / KE 1.02
Map Version 1
Date: May 2012

REFERENCE DOCUMENT

Conservation objectives for Silvermine Mountains SAC [000939]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	Description
4010	Northern Atlantic wet heaths with *Erica tetralix*
6230	Species-rich *Nardus* grasslands, on siliceous substrates in mountain areas (and submountain areas, in Continental Europe)*

* denotes a priority habitat

Citation: *NPWS (2018) Conservation objectives for Silvermine Mountains SAC [000939]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

REFERENCE DOCUMENT

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Silvermines Mountains West SAC 002258

An Roinn
Cultúir, Oidhreachta agus Gaeltachta

Department of
Culture, Heritage and the Gaeltacht

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Citation:

NPWS (2017) Conservation Objectives: Silvermines Mountains West SAC 002258. Version 1. National Parks and Wildlife Service, Department of Culture, Heritage and the Gaeltacht.

Series Editor: Rebecca Jeffrey
ISSN 2009-4086

Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002258	Silvermines Mountains West SAC
4010	Northern Atlantic wet heaths with *Erica tetralix*
4030	European dry heaths
6130	Calaminarian grasslands of the Violetalia calaminariae

Please note that this SAC overlaps with Slievefelim to Silvermines Mountain SPA (004165) and is adjacent to Lower River Shannon SAC (002165). See map 2. The conservation objectives for this site should be used in conjunction with those for the overlapping and adjacent sites as appropriate.

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2009
Title :	Bryophytes and metallophyte vegetation on metalliferous mine-waste in Ireland
Author :	Holyoak, D.T.
Series :	Unpublished report to NPWS
Year :	2012
Title :	Ireland Red List No. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2016
Title :	Ireland Red List No. 10: Vascular Plants
Author :	Wyse Jackson, M.; FitzPatrick, Ú.; Cole, E.; Jebb, M.; McFerran, D.; Sheehy Skeffington, M.; Wright, M.
Series :	Ireland Red Lists series, NPWS

Other References

Year :	2000
Title :	Appendix 2. Notes on the status and ecology of *Ditrichum cornubicum*
Author :	Holyoak, D.T.; Clements, R.; Coleman, M.R.J.; MacPherson, K.S.
Series :	English Nature Research Reports, No. 328: 40-50
Year :	2001
Title :	Heavy metal concentrations in the soil substrates associated with rare bryophytes at former metalliferous mining sites in East Cornwell
Author :	Walsh, L.
Series :	Unpublished B.Sc. Thesis, University of Hertfordshire
Year :	2009
Title :	Common Standards Monitoring guidance for upland habitats
Author :	JNCC
Series :	Joint Nature Conservation Committee, Peterborough
Year :	2012
Title :	Rare and threatened bryophytes of Ireland
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	National Museums Northern Ireland

Year :	2013
Title :	Conservation of selected legally protected and Red Listed bryophytes in Ireland
Author :	Campbell, C.
Series :	Unpublished Ph.D. Thesis, Trinity College Dublin
Year :	2013
Title :	Interpretation manual of European Union habitats- Eur 28
Author :	European Commission- DG Environment
Series :	European Commission

Spatial data sources

Year :	2012
Title :	Bryophytes and Metallophyte Vegetation on Metalliferous Mine-waste in Ireland
GIS Operations :	Sites identified; clipped to SAC boundary
Used For :	6130 (map 3)

Conservation Objectives for : Silvermines Mountains West SAC [002258]

4010 Northern Atlantic wet heaths with Erica tetralix

To maintain the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Silvermines Mountains West SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Northern Atlantic wet heaths with *Erica tetralix* has not been mapped in detail for Silvermines Mountains West SAC and thus the total area of the qualifying habitat in the SAC is unknown. Wet heath is the main habitat in Silvermines Mountains West SAC. The habitat is well-developed and shows good transitions to European dry heaths (4030), blanket bog and upland grassland in the SAC (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See the notes on Habitat area above
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	Relevant nutrients and their natural ranges are yet to be defined. However, nitrogen deposition is noted as being relevant to this habitat (NPWS, 2013)
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The entire diversity of wet heath vegetation communities within this SAC is unknown. Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: cross-leaved heath	Occurrence within 20m of a representative number of monitoring stops	Cross-leaved heath (*Erica tetralix*) present within a 20m radius of each monitoring stop	Attribute and target based on Perrin et al. (2014). Cross-leaved heath is the only characteristic species of the habitat listed in European Commission (2013). Whilst it is seldom abundant in wet heaths, its presence at high frequencies is considered one of the few characteristics common between the varied communities of this habitat (JNCC, 2009)
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50%	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented. Positive indicator species recorded in the habitat in the SAC include ling (*Calluna vulgaris*), common cottongrass (*Eriophorum angustifolium*), tormentil (*Potentilla erecta*), cross-leaved heath (*Erica tetralix*), with a good layer of bog mosses (*Sphagnum* spp., e.g. *Sphagnum capillifolium* and *S. papillosum*) and pleurocarpous mosses, including *Hypnum cupressiforme*, present (NPWS internal files)
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10%	Attribute and target based on Perrin et al. (2014). A plentiful lichen/bryophyte layer is characteristic of this habitat
Vegetation composition: ericoid species and crowberry	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15%	Attribute and target based on Perrin et al. (2014). A dwarf shrub layer with ericoid species is characteristic of this habitat (crowberry is only rarely present). Low cover of these species would be indicative of chronic overgrazing, burning, etc.
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrubs less than 75%	Attribute and target based on Perrin et al. (2014). A dwarf shrub layer is characteristic of wet heaths, but the vegetation should be a mixture of dwarf shrub and graminoid species, with higher cover of dwarf shrubs being potentially indicative of drainage
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented

Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Non-native species can be invasive and have deleterious effects on native vegetation. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014). High cover of native trees and shrubs would indicate that the habitat may be succeeding towards scrub or woodland due to lack of grazing or due to the habitat drying out
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014). High cover of bracken would indicate that the habitat may be succeeding towards a dense bracken community
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014). High cover of soft rush would suggest undesirable hydrological conditions. Note, however, that poor flushes dominated by soft rush can naturally occur in mosaic with this habitat. Discrete areas of this separate habitat should not be considered here
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Attribute and target based on Perrin et al. (2014). High levels of disturbed *Sphagnum* would indicate undesirable levels of grazers
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas for this habitat is also presented
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014). Disturbance can include hoof marks, wallows, human foot prints and vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion for heaths and peatlands
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Attribute and target based on Perrin et al. (2014). Drainage can result in loss of characteristic species and transition to drier habitats
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat and no decline in status of hepatic mats associated with this habitat	This includes species listed in the Flora (Protection) Order, 2015 (FPO) and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)

Conservation Objectives for : Silvermines Mountains West SAC [002258]

4030 European dry heaths

To maintain the favourable conservation condition of European dry heaths in Silvermines Mountains West SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	European dry heaths has not been mapped in detail for Silvermines Mountains West SAC and thus the total area of the qualifying habitat in the SAC is unknown. Although small in area and well-scattered, dry heath is considered to be well-represented in the SAC. The habitat occurs in association with Northern Atlantic wet heaths with *Erica tetralix* (4010), blanket bog and upland grassland and is found on the more steeply sloping ground below the summit ridge and on outcropping rock exposures in the SAC (NPWS internal files)
Habitat distribution	Occurrence	No decline, subject to natural processes	See the notes for Habitat area above
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	Relevant nutrients and their natural ranges are yet to be defined. However, nitrogen deposition is noted as being relevant to this habitat (NPWS, 2013)
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The entire diversity of dry heath vegetation communities within this SAC is unknown. Information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: lichens and bryophytes	Number of species at a representative number of 2m x 2m monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is at least three, excluding *Campylopus* and *Polytrichum* mosses	Attribute and target based on Perrin et al. (2014). Dry heath is not necessarily rich in lichen and bryophyte species, but a minimum amount should still be present
Vegetation composition: number of positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least two	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented. Positive indicator species recorded in the habitat in the SAC include western gorse (*Ulex gallii*), bell heather (*Erica cinerea*), ling (*Calluna vulgaris*) and bilberry (*Vaccinium myrtillus*) (NPWS internal files)
Vegetation composition: cover of positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50% for siliceous dry heath and 50-75% for calcareous dry heath	Attribute and target based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented
Vegetation composition: dwarf shrub composition	Percentage cover at a representative number of 2m x 2m monitoring stops	Proportion of dwarf shrub cover composed collectively of bog-myrtle (*Myrica gale*), creeping willow (*Salix repens*) and western gorse (*Ulex gallii*) is less than 50%	Attribute and target based on Perrin et al. (2014). Bog-myrtle is indicative of flushed conditions and is more characteristic of wet heaths and blanket bogs. Creeping willow is more characteristic of dune heaths. Western gorse is a component of dry heath, but high proportions of it may indicate a history of undesirable levels of grazing
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Attribute and target based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Attribute and target based on Perrin et al. (2014). Non-native species can be invasive and have deleterious effects on native vegetation. A low target is set as non-native species can spread rapidly and are most easily dealt with when still at lower abundances
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Attribute and target based on Perrin et al. (2014). High cover of native trees and shrubs would indicate that the habitat may be succeeding towards scrub or woodland due to lack of grazing

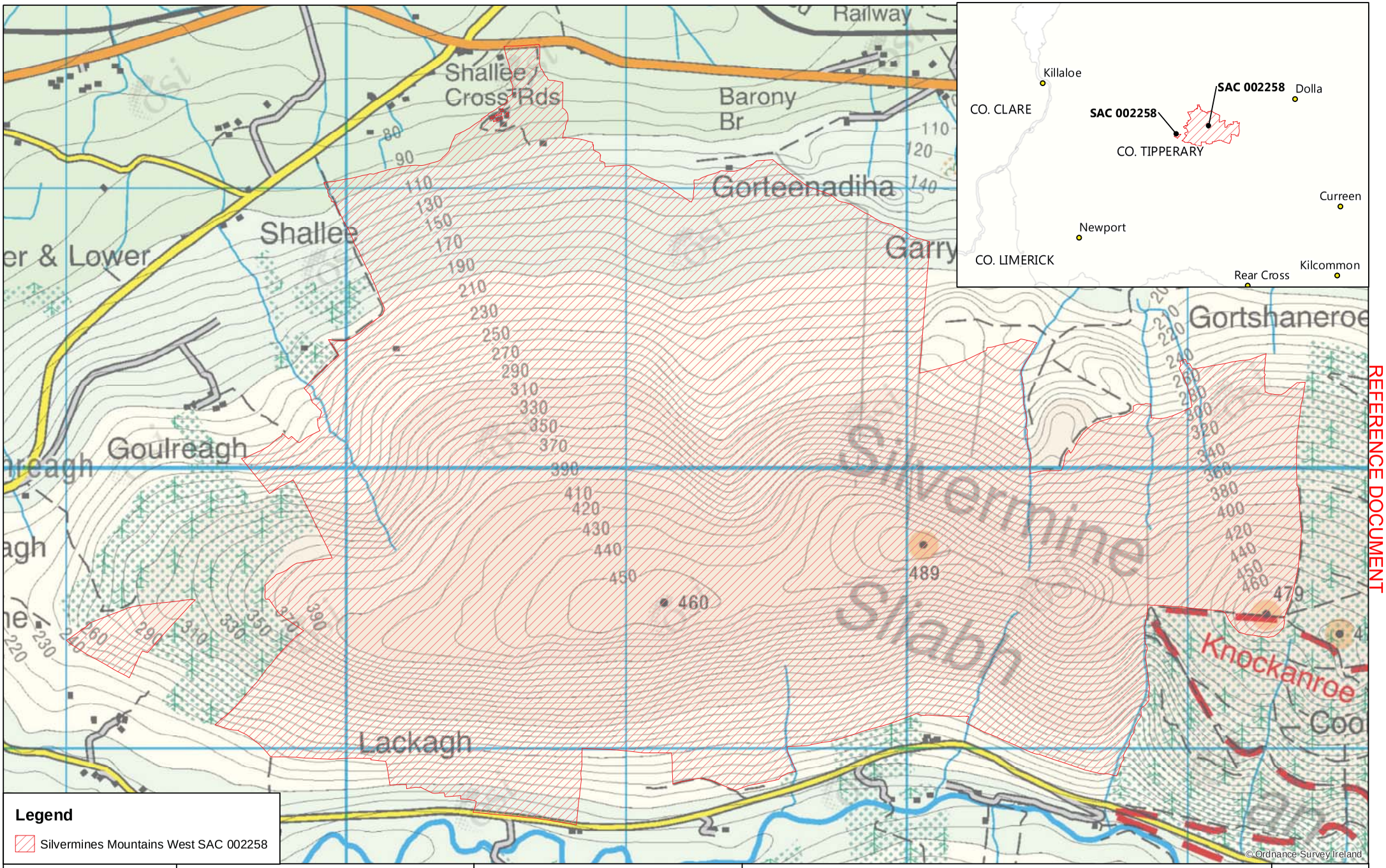
Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Attribute and target based on Perrin et al. (2014). High cover of bracken would indicate that the habitat may be succeeding towards a dense bracken community
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Attribute and target based on Perrin et al. (2014). High cover of soft rush would suggest undesirable hydrological conditions. Note, however, that poor flushes dominated by soft rush can naturally occur in mosaic with this habitat. Discrete areas of this separate habitat should not be considered here
Vegetation structure: senescent ling	Percentage cover at a representative number of 2m x 2m monitoring stops	Senescent proportion of ling (*Calluna vulgaris*) cover less than 50%	Attribute and target based on Perrin et al. (2014). Senescence is part of the natural cycle of ling, but a dominance of ling in the senescent phase would indicate a lack of management (appropriate grazing or burning) to promote ling regeneration
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids showing signs of browsing	Attribute and target based on Perrin et al. (2014)
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas is also presented. Fires can be part of the natural cycle of heaths and may, under carefully controlled circumstances, be used as an occasional management tool to promote regeneration of, or diversity of growth phases, in ling (*Calluna vulgaris*). However, currently most hill fires in Ireland are intentionally started to encourage grass growth for livestock. Fires which are too intense, too frequent, too extensive or which occur in sensitive areas are damaging to the habitat
Vegetation structure: growth phases of ling	Percentage cover in local vicinity of a representative number of monitoring stops	Outside sensitive areas, all growth phases of ling (*Calluna vulgaris*) should occur throughout, with at least 10% of cover in the mature phase	Attribute and target based on Perrin et al. (2014), where the list of sensitive areas is also presented. The growth phases of ling are pioneer (<10cm high), building (10-30cm high) and mature (<30cm high). As burning is undesirable in sensitive areas, it is not reasonable to require the stated diversity of growth phases within these areas
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Attribute and target based on Perrin et al. (2014). Disturbance can include hoof marks, wallows, human foot prints and vehicle and machinery tracks. Excessive disturbance can result in loss of characteristic species and presage erosion for heaths and peatlands
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists (Lockhart et al., 2012; Wyse Jackson et al., 2016)

Conservation Objectives for : Silvermines Mountains West SAC [002258]

6130 Calaminarian grasslands of the Violetalia calaminariae

To maintain the favourable conservation condition of Calaminarian grasslands of the Violetalia calaminariae in Silvermines Mountains West SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	No decline, subject to natural processes	Calaminarian grasslands of the Violetalia calaminariae was surveyed in detail by Holyoak (2009) at Shallee within Silvermines Mountains West SAC where the area of the habitat is estimated to be 0.9ha
Distribution	Location	No decline, subject to natural processes. See map 3 for the surveyed point location at Shallee	Shallee is a former lead mine in the north of the SAC with extensive old lead mine workings and ore-processing works situated low on a north-facing slope near the west end of Silvermines Mountains. Calaminarian grassland is extensive and well-developed on the mine spoil at Shallee (Holyoak, 2009)
Physical structure: bare ground	Percentage cover	Maintain adequate open ground	At Shallee, the extent of bare soil and rock within four (50cm x 50cm) quadrats (recorded in 2008) ranged between c.3% and 50% (Holyoak, 2009)
Soil toxicity: heavy metal content	µg/g dry weight soil	Maintain high levels of the heavy metals copper and lead in soil	The total copper content in a sample of mine spoil taken from Shallee in 2009 was 4,998.5µg/g dry weight and the total lead content was 24,473µg/g dry weight (Campbell, 2013). Mine spoil with similar vegetation from Cornwall had available copper of 151–3,220µg/g dry weight (Holyoak et al., 2000; Walsh, 2001)
Vegetation structure: height and cover	Centimetres; percentage cover	Maintain low and open vegetation	At Shallee, herbaceous vegetation height was recorded within four (50cm x 50cm) quadrats (in 2008) as quite short (0-8cm) and vascular plant cover was low (0-10%). Bryophyte cover was relatively high (11-75%) (Holyoak, 2009)
Vegetation composition: metallophyte bryophytes	Number	Maintain diversity and populations of metallophyte bryophytes	The liverwort *Cephaloziella nicholsonii*, which is listed on the Flora (Protection) Order, 2015 (FPO) and classified as Vulnerable (Lockhart et al., 2012) occurs at Shallee, as does the Near Threatened *C. stellulifera* (Holyoak, 2009; Lockhart et al., 2012). The largest of the four Irish populations of the Endangered and FPO listed moss *Ditrichum plumbicola* (Lockhart et al., 2012) is also found at Shallee (Holyoak, 2009)



Legend

Silvermines Mountains West SAC 002258

An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

MAP 1:
SILVERMINES MOUNTAINS WEST SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002258; version 3.01. CO. TIPPERARY

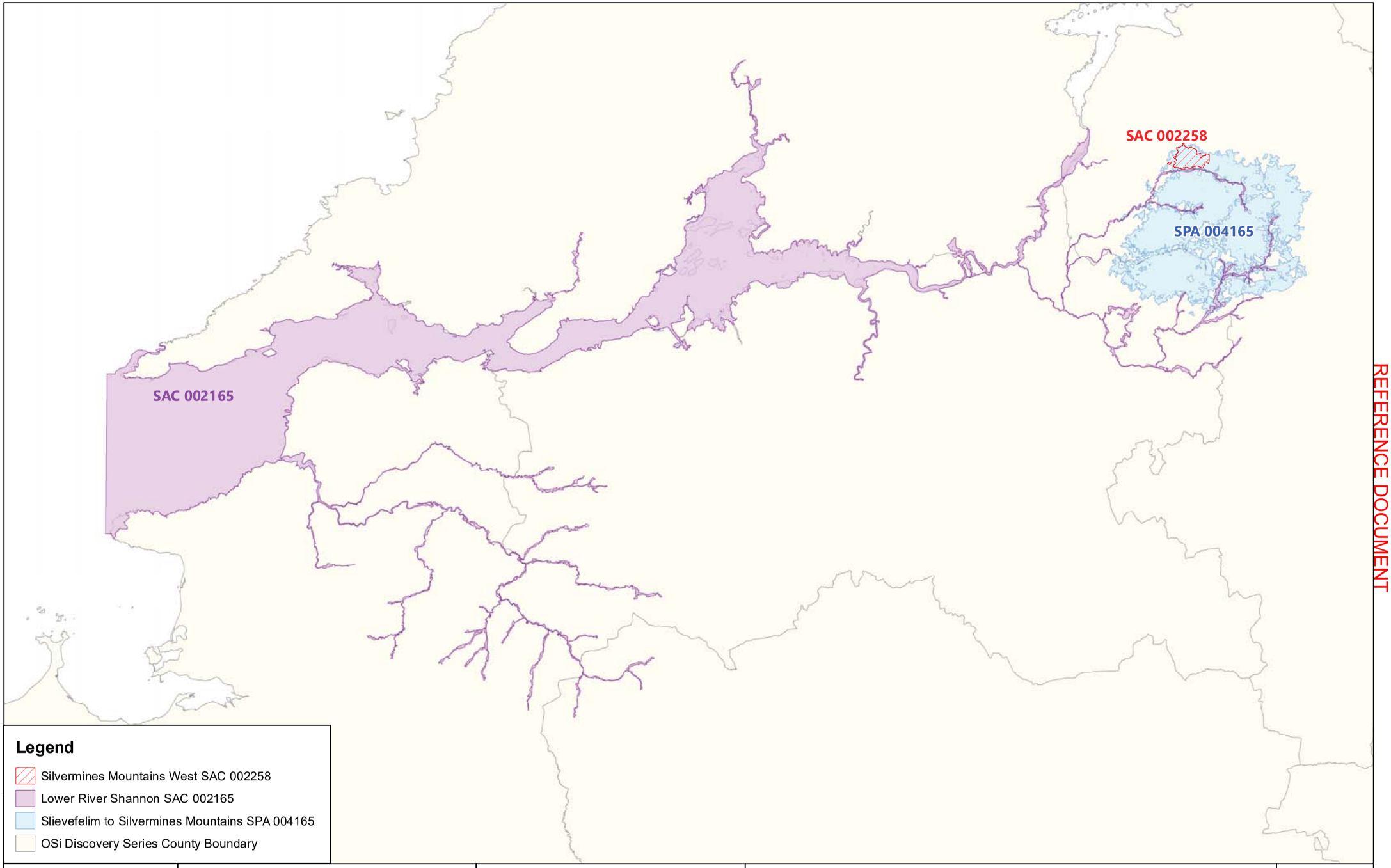
0 140 280 420 560 700 Meters

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision. Ordnance Survey of Ireland Licence No EN 0059216. © Ordnance Survey of Ireland Government of Ireland

Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059216. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

N

Map Version 1
Date: Aug 2017



REFERENCE DOCUMENT

Legend

- Silvermines Mountains West SAC 002258
- Lower River Shannon SAC 002165
- Slievefelim to Silvermines Mountains SPA 004165
- OSi Discovery Series County Boundary

An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

MAP 2:
SILVERMINES MOUNTAINS WEST SAC
CONSERVATION OBJECTIVES
OVERLAPPING DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002258; version 3.01. SAC 002165; version 3.01;
SPA 004165; version 3.
CO. TIPPERARY / CO. LIMERICK

0 3.5 7 10.5 14 17.5 Kilometers

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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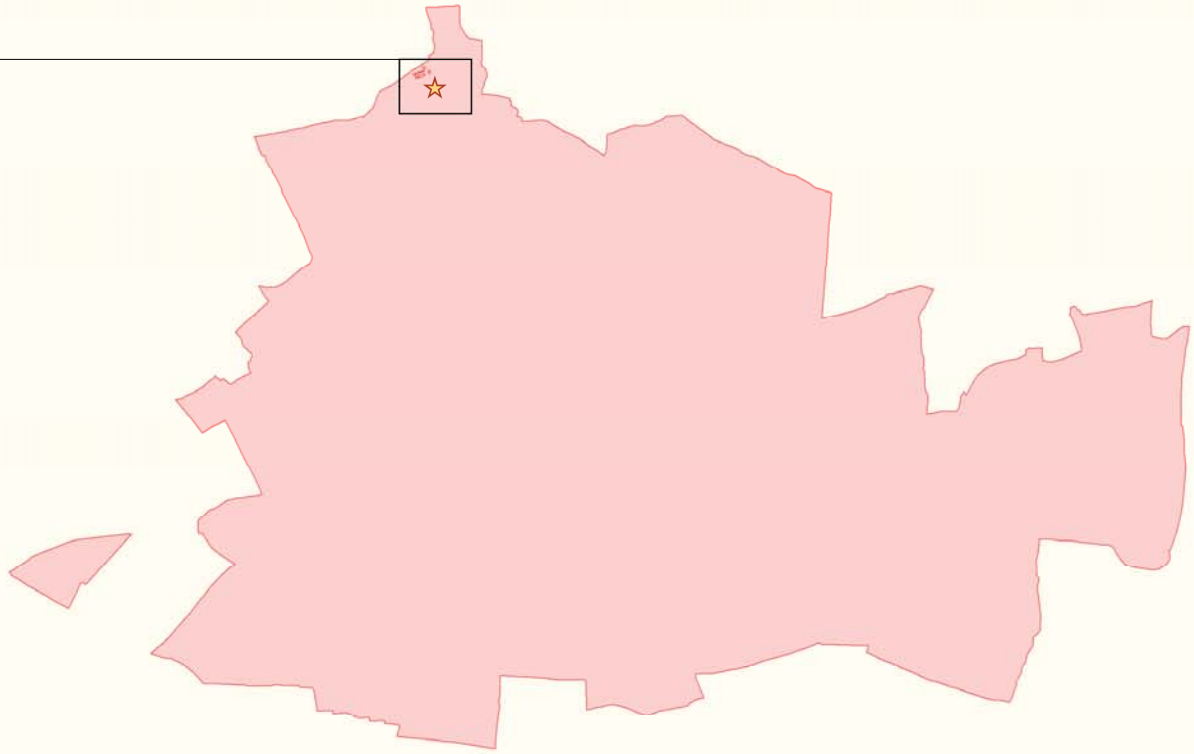
Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059216. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

N

Map Version 1
Date: July 2017



Legend

- 6130 Calaminarian grasslands of the *Violetalia calaminariae*
- Silvermines Mountains West SAC 002258
- OSi Discovery Series County Boundaries

An Roinn Cultúir, Oidhreachta agus Gaeltachta
Department of Culture, Heritage and the Gaeltacht

MAP 3:
SILVERMINES MOUNTAINS WEST SAC
CONSERVATION OBJECTIVES
CALAMINARIAN GRASSLAND

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002258; version 3.01. CO. TIPPERARY

0 240 480 720 960 1,200 Meters

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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Map Version 1
Date: Aug 2017

REFERENCE DOCUMENT

ISSN 2009-4086

National Parks and Wildlife Service

Conservation Objectives Series

Slieve Bernagh Bog SAC 002312

An Roinn Ealaíon, Oidhreachta,
Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta

Department of Arts, Heritage,
Regional, Rural and Gaeltacht Affairs

National Parks and Wildlife Service,
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs,

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Citation:

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Series Editor: Rebecca Jeffrey
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Introduction

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

A site-specific conservation objective aims to define favourable conservation condition for a particular habitat or species at that site.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Notes/Guidelines:

1. The targets given in these conservation objectives are based on best available information at the time of writing. As more information becomes available, targets for attributes may change. These will be updated periodically, as necessary.
2. An appropriate assessment based on these conservation objectives will remain valid even if the targets are subsequently updated, providing they were the most recent objectives available when the assessment was carried out. It is essential that the date and version are included when objectives are cited.
3. Assessments cannot consider an attribute in isolation from the others listed for that habitat or species, or for other habitats and species listed for that site. A plan or project with an apparently small impact on one attribute may have a significant impact on another.
4. Please note that the maps included in this document do not necessarily show the entire extent of the habitats and species for which the site is listed. This should be borne in mind when appropriate assessments are being carried out.
5. When using these objectives, it is essential that the relevant backing/supporting documents are consulted, particularly where instructed in the targets or notes for a particular attribute.

Qualifying Interests

**** indicates a priority habitat under the Habitats Directive***

002312	Slieve Bernagh Bog SAC
4010	Northern Atlantic wet heaths with *Erica tetralix*
4030	European dry heaths
7130	Blanket bogs (* if active bog)

Supporting documents, relevant reports & publications

Supporting documents, NPWS reports and publications are available for download from: www.npws.ie/Publications

NPWS Documents

Year :	2012
Title :	Ireland Red List no. 8: Bryophytes
Author :	Lockhart, N.; Hodgetts, N.; Holyoak, D.
Series :	Ireland Red List series, NPWS
Year :	2013
Title :	The status of EU protected habitats and species in Ireland. Volume 2. Habitats assessments
Author :	NPWS
Series :	Conservation assessments
Year :	2014
Title :	Guidelines for a national survey and conservation assessment of upland vegetation and habitats in Ireland, Version 2.0
Author :	Perrin, P.M.; Barron, S.J.; Roche, J.R.; O'Hanrahan, B.
Series :	Irish Wildlife Manual No. 79
Year :	2016
Title :	Slieve Bernagh Bog SAC (site code: 2312) Conservation objectives supporting document-upland habitats V1
Author :	NPWS
Series :	Conservation objectives supporting document

Other References

Year :	1988
Title :	The Irish red data book 1. Vascular plants
Author :	Curtis, T.G.F; McGough, H.N.
Series :	Wildlife Service, Dublin
Year :	2001
Title :	Assessment of impacts on flora and fauna of a proposed wind farm development at Slieve Bearnagh, Co. Clare.
Author :	Biosphere Environmental Services (BES)
Series :	Unpublished report for O'Loughlin Environmental Services (OES), Tralee, Ireland

Conservation Objectives for : Slieve Bernagh Bog SAC [002312]

4010 Northern Atlantic wet heaths with Erica tetralix

To restore the favourable conservation condition of Northern Atlantic wet heaths with *Erica tetralix* in Slieve Bernagh Bog SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Northern Atlantic wet heaths with *Erica tetralix* habitat has not been mapped in detail for Slieve Bernagh Bog SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 400ha. Further information can be found in BES (2001). Further details on this and the following attributes can be found in the Slieve Bernagh Bog SAC conservation objectives supporting document for uplands habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Areas of wet heath have been recorded throughout the SAC; information from the GIS files associated with NPWS (2013). Further information can be found within this source and the uplands supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the uplands supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The diversity of wet heath communities within this SAC is unknown. Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: cross-leaved heath	Occurrence within 20m of a representative number of 2m x 2m monitoring stops	Cross-leaved heath (*Erica tetralix*) present near each monitoring stop	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50%	Based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented. See the uplands supporting document for further details
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of *Cladonia* and *Sphagnum* species, *Racomitrium lanuginosum* and pleurocarpous mosses at least 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: ericoid species and crowberry	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of ericoid species and crowberry (*Empetrum nigrum*) at least 15%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: dwarf shrub species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of dwarf shrubs less than 75%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Based on Perrin et al. (2014), where the list of negative indicator species is also presented. See the uplands supporting document for further details
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Based on Perrin et al. (2014). See the uplands supporting document for further details

Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: burning	Occurrence in local vicinity of a representative number of 2m x 2m monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Based on Perrin et al. (2014), where the list of sensitive areas is also presented. See the uplands supporting document for further details
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Physical structure: drainage	Percentage cover in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists, Curtis and McGough (1988) and Lockhart et al. (2012). See the uplands supporting document for further details

Conservation Objectives for : Slieve Bernagh Bog SAC [002312]

4030 European dry heaths

To restore the favourable conservation condition of European dry heaths in Slieve Bernagh Bog SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	European dry heaths have not been mapped in detail for Slieve Bernagh Bog SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 3ha. Further information can be found in BES (2001). Further details on this and the following attributes can be found in the Slieve Bernagh Bog SAC conservation objectives supporting document for upland habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Dry heath appears to be confined to the summits and steeper slopes within the SAC; information from the GIS files associated with NPWS (2013), and it has been recorded on the steep slopes of Moylussa by BES (2001). Further information can be found within these sources and the uplands supporting document
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the uplands supporting document for further details
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	The diversity of dry heath communities within this SAC is unknown. Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: lichens and bryophytes	Number of species at a representative number of 2m x 2m monitoring stops	Number of bryophyte or non-crustose lichen species present at each monitoring stop is at least three, excluding *Campylopus* and *Polytrichum* mosses	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: number of positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species present at each monitoring stop is at least two	Based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented. See the uplands supporting document for further details
Vegetation composition: cover of positive indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of positive indicator species at least 50% for siliceous dry heath and 50-75% for calcareous dry heath	Based on Perrin et al. (2014), where the list of positive indicator species for this habitat, which is composed of dwarf shrubs, is also presented. See the uplands supporting document for further details
Vegetation composition: dwarf shrub composition	Percentage cover at a representative number of 2m x 2m monitoring stops	Proportion of dwarf shrub cover composed collectively of bog-myrtle (*Myrica gale*), creeping willow (*Salix repens*) and western gorse (*Ulex gallii*) is less than 50%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Based on Perrin et al. (2014), where the list of negative indicator species is also presented. See the uplands supporting document for further details
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: native trees and shrubs	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 20%	Based on Perrin et al. (2014). See the uplands supporting document for further details

Vegetation composition: bracken	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of bracken (*Pteridium aquilinum*) less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: soft rush	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of soft rush (*Juncus effusus*) less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: senescent ling	Percentage cover at a representative number of 2m x 2m monitoring stops	Senescent proportion of ling (*Calluna vulgaris*) cover less than 50%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Less than 33% collectively of the last complete growing season's shoots of ericoids showing signs of browsing	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas	Based on Perrin et al. (2014), where the list of sensitive areas is also presented. See the uplands supporting document for further details
Vegetation structure: growth phases of ling	Percentage cover in local vicinity of a representative number of monitoring stops	Outside sensitive areas, all growth phases of ling (*Calluna vulgaris*) should occur throughout, with at least 10% of cover in the mature phase	Based on Perrin et al. (2014). See the uplands supporting document for further details
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat and no decline in status of hepatic mats associated with this habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists, Curtis and McGough (1988) and Lockhart et al. (2012). See the uplands supporting document for further details

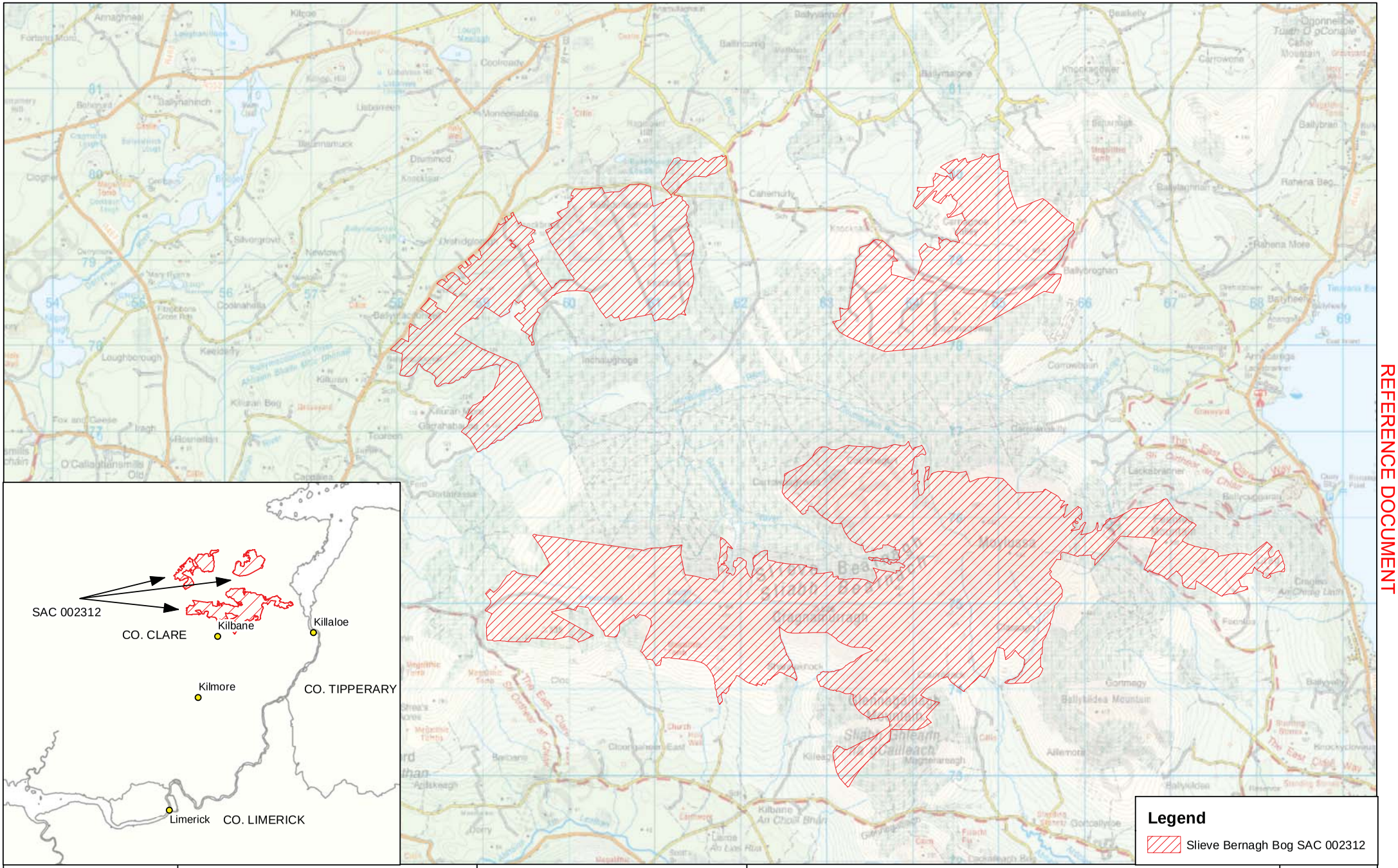
Conservation Objectives for : Slieve Bernagh Bog SAC [002312]

7130 Blanket bogs (* if active bog)

To restore the favourable conservation condition of Blanket bogs in Slieve Bernagh Bog SAC, which is defined by the following list of attributes and targets:

Attribute	Measure	Target	Notes
Habitat area	Hectares	Area stable or increasing, subject to natural processes	Blanket bog has not been mapped in detail for Slieve Bernagh Bog SAC, but from current available data the total area of the qualifying habitat is estimated to be approximately 140ha. Further information can be found in BES (2001). Further details on this and the following attributes can be found in the Slieve Bernagh Bog SAC conservation objectives supporting document for upland habitats
Habitat distribution	Occurrence	No decline, subject to natural processes	Blanket bog has been recorded throughout the SAC; information from the GIS files associated with NPWS (2013). Further information can be found within this source and see above
Ecosystem function: soil nutrients	Soil pH and appropriate nutrient levels at a representative number of monitoring stops	Maintain soil nutrient status within natural range	See the uplands supporting document for further details
Ecosystem function: peat formation	Active blanket bog as a proportion of the total area of Annex I blanket bog habitat	At least 99% of the total Annex I blanket bog area is active	See the uplands supporting document for further details
Ecosystem function: hydrology	Flow direction, water levels, occurrence of drains and erosion gullies	Natural hydrology unaffected by drains and erosion	Further details and a brief discussion of restoration potential is presented in the uplands supporting document
Community diversity	Abundance of variety of vegetation communities	Maintain variety of vegetation communities, subject to natural processes	BES (2001) recorded two blanket bog communities within this SAC. See the uplands supporting document for more details. Further information on vegetation communities associated with this habitat is presented in Perrin et al. (2014)
Vegetation composition: positive indicator species	Number of species at a representative number of 2m x 2m monitoring stops	Number of positive indicator species at each monitoring stop is at least seven	Based on Perrin et al. (2014), where the list of positive indicator species for this habitat is also presented. See the uplands supporting document for further details
Vegetation composition: lichens and bryophytes	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of bryophytes or lichens, excluding *Sphagnum fallax*, at least 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: potential dominant species	Percentage cover at a representative number of 2m x 2m monitoring stops	Cover of each of the potential dominant species less than 75%	Based on Perrin et al. (2014). See the uplands supporting document for further details, including the list of potentially dominant species
Vegetation composition: negative indicator species	Percentage cover at a representative number of 2m x 2m monitoring stops	Total cover of negative indicator species less than 1%	Based on Perrin et al. (2014), where the list of negative indicator species for this habitat is also presented. See the uplands supporting document for further details
Vegetation composition: non-native species	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of non-native species less than 1%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation composition: native trees and scrub	Percentage cover in local vicinity of a representative number of monitoring stops	Cover of scattered native trees and shrubs less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: *Sphagnum* condition	Condition at a representative number of 2m x 2m monitoring stops	Less than 10% of the *Sphagnum* cover is crushed, broken and/or pulled up	Based on Perrin et al. (2014). See the uplands supporting document for further details

Vegetation structure: signs of browsing	Percentage of shoots browsed at a representative number of 2m x 2m monitoring stops	Last complete growing season's shoots of ericoids, crowberry (*Empetrum nigrum*) and bog-myrtle (*Myrica gale*) showing signs of browsing collectively less than 33%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Vegetation structure: burning	Occurrence in local vicinity of a representative number of monitoring stops	No signs of burning in sensitive areas, into the moss, liverwort or lichen layer or exposure of peat surface due to burning	Based on Perrin et al. (2014), where the list of sensitive areas is also presented. See the uplands supporting document for further details
Physical structure: disturbed bare ground	Percentage cover at, and in local vicinity of, a representative number of 2m x 2m monitoring stops	Cover of disturbed bare ground less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Physical structure: drainage	Percentage area in local vicinity of a representative number of monitoring stops	Area showing signs of drainage from heavy trampling, tracking or ditches less than 10%	Based on Perrin et al. (2014). See the uplands supporting document for further details
Physical structure: erosion	Occurrence in local vicinity of a representative number of monitoring stops	Less than 5% of the greater bog mosaic comprises erosion gullies and eroded areas	Based on Perrin et al. (2014). See the uplands supporting document for further details
Indicators of local distinctiveness	Occurrence and population size	No decline in distribution or population sizes of rare, threatened or scarce species associated with the habitat	This includes species listed in the Flora (Protection) Order, 2015 and/or the red data lists, Curtis and McGough (1988) and Lockhart et al. (2012). See the uplands supporting document for further details



REFERENCE DOCUMENT

An Roinn Ealaíon, Oidhreachta, Gnóthaí Réigiúnacha, Tuaithe agus Gaeltachta
Department of Arts, Heritage, Regional, Rural and Gaeltacht Affairs

MAP 1:
SLIEVE BERNAGH BOG SAC
CONSERVATION OBJECTIVES
SAC DESIGNATION

Map to be read in conjunction with the NPWS Conservation Objectives Document.

SITE CODE:
SAC 002312; version 3.
CO. CLARE / CO. LIMERICK / CO. TIPPERARY

0 0.4 0.8 1.2 1.6 2 km

The mapped boundaries are of an indicative and general nature only. Boundaries of designated areas are subject to revision.
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Níl sna teorainneacha ar na léarscáileanna ach nod garshuiomhach ginearálta. Féadfar athbhreithnithe a déanamh ar theorainneacha na gceantar comharthaithe. Suirbhéarachta Ordonáis na hÉireann Ceadúnas Uimh EN 0059216. © Suirbhéarachta Ordonáis na hÉireann Rialtas na hÉireann

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Map Version 1
Date: July 2016

Conservation objectives for Slievefelim to Silvermines Mountains SPA [004165]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	Common Name	Scientific Name
A082	Hen Harrier	*Circus cyaneus*

Citation: *NPWS (2018) Conservation objectives for Slievefelim to Silvermines Mountains SPA [004165]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA [004161]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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- 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.

Objective: To maintain or restore the favourable conservation condition of the bird species listed as Special Conservation Interests for this SPA:

Bird Code	Common Name	Scientific Name
A082	Hen Harrier	*Circus cyaneus*

Citation: *NPWS (2018) Conservation objectives for Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA [004161]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Conservation objectives for Tory Hill SAC [000439]

The overall aim of the Habitats Directive is to maintain or restore the favourable conservation status of habitats and species of community interest. These habitats and species are listed in the Habitats and Birds Directives and Special Areas of Conservation and Special Protection Areas are designated to afford protection to the most vulnerable of them. These two designations are collectively known as the Natura 2000 network.

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. The Government and its agencies are responsible for the implementation and enforcement of regulations that will ensure the ecological integrity of these sites.

The maintenance of habitats and species within Natura 2000 sites at favourable conservation condition will contribute to the overall maintenance of favourable conservation status of those habitats and species at a national level.

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.

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.

Objective: To maintain or restore the favourable conservation condition of the Annex I habitat(s) and/or the Annex II species for which the SAC has been selected:

Code	Description
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)
7210	Calcareous fens with *Cladium mariscus* and species of the Caricion davallianae*
7230	Alkaline fens

* denotes a priority habitat

Citation: *NPWS (2018) Conservation objectives for Tory Hill SAC [000439]. Generic Version 6.0. Department of Culture, Heritage and the Gaeltacht.*

Whole Upperchurch Windfarm Project

Natura Impact Statement
for
Whole UWF Project Elements 1 to 5

May 2018

Appendix A3: Finding of No Significant Effects (FONSE) Report

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Finding of No Significant Effects Report

In accordance with the EC (2001) guidance document, *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*, A Finding of No Significant Effects Report has been completed for the Whole Upperchurch Windfarm Project, and its respective individual Elements (1.UWF Grid Connection (GC); 2.UWF Related Works (RW); 3.UWF Replacement Forestry (RF); 4.Upperchurch Windfarm (UWF); 5.UWF Other Activities (OA)). The standard matrix for this report provided in Annex 2 of the guidance document was followed. Line items in italics are taken directly from the guidance document.

Finding of No Significance Effects Report	
Name and location of the Natura 2000 sites	The screening appraisal provided herein has examined potential effects via source pathway linkages on the designated SACs and SPAs within 15km of the Whole Upperchurch Windfarm Project (Whole UWF Project). There is a total of 23 no. European or Natura 2000 sites located within the 15km zone of consideration. Following screening it can reasonably be concluded that there is no possibility of Significant Effects on 21 of the 23 European sites as a result of the Whole UWF Project. 1. Anglesey Road SAC (002125) 2. Askeaton Fen Complex SAC (002279) 3. Barrigone SAC (Site Code: 000432) 4. Bolingbrook Hill SAC (002124) 5. Clare Glen SAC (000930) 6. Curraghchase Woods SAC (000174) 7. Glenomra Wood SAC (001013) 8. Glenstal Wood SAC (001432) 9. Kilduff, Devilsbit Mountain SAC (000934) 10. Keeper Hill SAC (001197) 11. Lough Derg (Shannon) SPA (004058) 12. Lough Derg, North-East Shore SAC (002241) 13. Lower River Suir SAC (002137) 14. Philipston Marsh SAC (001847) 15. Ratty River Cave SAC (002316) 16. River Shannon and River Fergus Estuaries SPA (004077) 17. Silvermine Mountain SAC (000939) 18. Silvermine Mountain West SAC (002258) 19. Slieve Bernagh SAC (002312) 20. Stack's to Mullaghareirk Mountains, West Limerick Hills and Mount Eagle SPA (004161) 21. Tory Hill SAC (000439
Description of the project or plan	**Overview:** The Whole UWF Project comprises the following elements – UWF Grid Connection, UWF Related Works, UWF Replacement Forestry, Upperchurch Windfarm and UWF Other Activities (see Table 2.1 of the NIS). **Purpose:** The purpose of the UWF Grid Connection, UWF Related Works, UWF Replacement Forestry and UWF Other Activities Elements is to facilitate the

Finding of No Significance Effects Report	
	construction and operation of the Upperchurch Windfarm. The Upperchurch Windfarm, when operational, will produce renewable electricity from the wind to supply the National Grid. Upperchurch Windfarm has already been consented.
Is the Project or Plan directly connected with or necessary to the management of the site (provide details)?	No
Are there other projects or plans that together with the project of plan being assessed could affect the site (provide details)?	Yes In addition to any in-combination effects from the individual Whole UWF Project Elements 1 to 5, the following projects were considered: 1 Castlewaller Windfarm, Co. Tipperary 2 Newport Distributor Road, Newport, Co.Tipperary 3 Bunkimalta Windfarm, Co. Tipperary 4 Agricultural Development - Milking Parlour, Bunkey, Lisnagry, Co. Limerick 5 Housing Development, Doon, Co. Tipperary 6 Agricultural Development – Sheds and stores, Killuragh, Pallasgreen, Co. Limerick 7 Killuragh Digester Plant, Pallasgreen, Co. Limerick 8 Agricultural Development - Milking Parlour, Portnard, Cappamore, Co. Limerick 9 Housing Development, Annacotty, Co. Limerick 10 General Agriculture and Forestry operations, and turf-cutting
The Assessment of Significant Effects	
Describe how the project or plan (alone or in combination) is likely to affect the Natura 2000 site	The proposed project is not likely to affect the European sites.
Explain why these effects are not considered significant	Stage 1 Conceptual Models have been presented in respect of each European Site within 15km of the Whole UWF Project in Section 4.2 of the NIS. Within same, potential sources of significant effects (alone or in combination) from the constituent Whole UWF Project Elements 1 to 5 have been examined. In respect of the European Sites listed above, the combination of Project Design Measures to avoid Environmental Effects, Implementation of Best Practice Measures, and general absence of source-impact-pathway linkage implies that Potential for Significant Effects can be excluded. We refer Section 4.2 of the NIS for detailed examination.
Name of Agency or Body Consulted	**Summary of Response**
DAU –Michael Murphy NPWS – Jervis Good, Pat Foley, Stefan Jones, Áine Lynch IFI – Michael Fitzsimons, Frank O'Donoghue	See 'See Document Titled Appendix 8.1: Detailed Biodiversity Data and Supplementary Information (Section A8-1.2.1), within Appendix A14 of the NIS for the Whole UWF Project Elements 1 to 5 for a detailed chronology of consultation.

Finding of No Significance Effects Report			
Tipperary County Council			
Data Collected to Carry out the Assessment			
Who carried out the assessment	*Sources of Data*	*Level of assessment completed*	*Where can the full results of the assessment be accessed and viewed*
Inis Environmental Consultants Ltd. **Suite 11, Shannon Commercial Properties, Information Age Park, Gort Road, Ennis, Co. Clare**	A combination of consultation, desktop studies and comprehensive field surveys.	Following screening it can reasonably be concluded that there is no possibility of Significant Effects on 21 of these 23 European sites as a result of the Development. With regard to the following listed EU Sites, Significant Effects, in the absence of mitigation (which is not considered at Screening Stage) are considered possible or likely via identified source-pathway linkages: 1. Lower River Shannon SAC (002165) 2. Slievefelim to Silvermines SPA (004077) As a result, there is an obligation on the Competent Authority to carry out an Appropriate Assessment (i.e. Stage Two of the AA process) under Article 6 (3) of the Habitats Directive for this project, and in this context a Stage 2 Appropriate Assessment Report has been completed.	The public office and website for An Bord Pleanála, Dublin; the element website: the public office and website for Tipperary County Council, Nenagh, Co Tipperary and the public offices of the Minister for Agriculture, Food and the Marine. In addition, the Appropriate Assessment Reporting Documents can be viewed on the following website, which is the dedicated website for the UWF Grid Connection (Element 1 of the Whole UWF Project): www.upperchurchgridconnection.ie

Whole Upperchurch Windfarm Project

Natura Impact Statement
for
Whole UWF Project Elements 1 to 5

May 2018

Appendix A17: UWF Grid Connection HDD Risk Assessment

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UWF GRID CONNECTION HDD RISK ASSESSMENT.

A preliminary report reviewing the potential for frac-out using HDD at three river crossing locations.

Project Reference No. FR_EN1695

Client: Ecopower Ltd

Zetec House, Purcellsinch IDA Business Park, Co. Kilkenny

Rev: 001

February 11, 2018

Geo Trenchless Solutions Ltd. t/a Geo Drilling Solutions

Dunmahon, Ardee Road, Dundalk County Louth, Ireland. A91 TYT4

REFERENCE DOCUMENT

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NOMENCLATURE

BGL – Below Ground Level

BH – Borehole

CP – Cable Percussion

ERT – Electrical Resistivity Tomography

GDS – Geo Drilling Solutions

GL – Ground level

GSI – Geological Society Ireland

GWB - Ground Water Body

GWL – Ground Water Level

HDD – Horizontal Directional Drilling

ID – Internal Diameter

OD – Outside Diameter

PDC - Polycrystalline Diamond Materials

PE – Polyethylene

RDX – Road Crossing

ROP – Rate of Penetration

RVX – River Crossing

RC – Rotary Core

SDC - Specialist Drilling Contractor.

SPT – Standard Penetration Test

TD – Total Depth

WF - Windfarm

INTRODUCTION

OVERVIEW

Geo Drilling Solutions (GDS) are a specialist ground engineering consultancy, with over 20 years' experience in drilling design and construction. Niall Meehan director of GDS is accredited with a Bachelors of Engineering in Environment Engineering, a member of the Pipe Industry Guild and Engineers Ireland and is on the panel of experts for Geoscience Ireland. Over the years Niall has operated in the Water well, HDD, geothermal, geotechnical, environmental and hydrocarbon sectors providing a design and build service, see Appendix B.

GDS have prepared this report in relation to the three locations where HDD is required on the UWF Grid Connection route.

The UWF Grid Connection includes the installation of underground cables along a 27.5km route (110kV UGC) between Mountphilips townland near Newport and Knockcurraghbola Commons townland near Kilcommon, County Tipperary.

There are three river crossing locations on the route of the 110kV UGC – Watercourse Crossing No. W10 at the Mulkear River, W36 at the Clare River and W57 at the Bilboa River.

Each crossing will utilise drilling techniques to install the ducts for the cables beneath the river bed. HDD using rock tooling will be used at the Mulkear River (W10) crossing, while conventional HDD jetting assemblies will be used at the crossing points of the Clare River (W36) and the Bilboa River (W57).

The probability of a frac-out during drilling activities at the three river crossings is evaluated in this report.

SCOPE OF WORKS

Each river crossing where horizontal directional drilling (HDD) is proposed to underground the cable is to be assessed under the following criteria:

- Site visit and inspection of each drilling location by GDS
- Review the geophysical and geotechnical data.
- Assess the risk of a frac out at each location.
- Prepare a Frac Out Contingency Plan

SITE VISIT

A site visit was carried out on the 17th of November 2017.

Site address:

Mulkear RVX: Newport, County Tipperary. 52°43'33.3"N 8°22'29.1"W

Clare RVX: Bealaclave, County Tipperary. 52°42'28.3"N 8°15'38.8"W

Bilboa RVX: Kilcommon, County Tipperary. 52°41'29.8"N 8°09'14.9"W

The locations can be found in Appendix A, Figure 11 – RVX locations for proposed HDD.

MULKEAR RVX

Observations: The overburden was observed as a sandy soil on the western river banks, Figure 2. Bedrock can be seen outcropping (horizon bedding planes) on the east side of the waterway and in the river channel, Figure 1. Fast flowing water way. The topography rises steeply on the east side of the crossing which may indicate a fault line which has the potential of creating a pathway for inadvertent drilling fluids returning to surface.

3rd Party Utilities: No other utilities observed.

Figure 1 – Outcropping bedrock on the eastern river bank.

Figure 2 – Sandy overburden on the western river bank.

CLARE RVX

Observations: Shallow fast flowing waterway. Steeply flanked valley, Figure 3.
Soft peat/clay formation in the base of the valley. Valley floor is flat. Gravel deposits in the riverbed, Figure 4.

3rd Party Utilities: No other utilities observed.

Figure 3 – Elevated view over the site from the east.

Figure 4 – Shallow fast flowing waterway.

BILBOA RVX

Observations: No bedrock observed in the waterway. Shallow fast flowing waterway. Rolling landscape towards the valley floor where the river is located, Figure. Soft peat/clay formation in the base of the valley, undrained grasslands. Gravel deposits in the riverbed, Figure 5.

3rd Party Utilities: None observed.

Figure 5 – Shallow narrow water way, observed from the western bank.

Figure 6 – Undulating landscape on the western side of the RVX, falling towards the river.

REVIEW OF THE GEOPHYSIC SURVEY OF THE MULKEAR RIVER

APEX Geoservices Limited was requested by ECOPOWER to carry out a geophysical investigation at the Mulkear River, Newport, County Tipperary. The investigation was requested prior to directional drilling beneath the river for the grid connection element of the Upperchurch Wind Farm. The investigation was carried out over a single session on the 11th January 2018 and involved the collection of 2no. ERT profiles (2 x 93m) and 4 no. seismic refraction profiles (4 x 46m) across the site. See Appendix 10.5 of the UWF Grid Connection EIA Report.

The area under investigation is underlain by the Keepers Hill Formation consisting of sandstone, grits and claystone.

The geophysical investigation comprised of Electrical Resistivity Tomography and Seismic Refraction profiling.

The objectives of the investigation were to provide information on the type and thickness of the soils, estimate soil stiffness, assess depth to and weathering of bedrock, identify bedrock type and identify any faults / fissures in the bedrock.

RESULTS

ERT

The ERT profiles and geological interpretations are displayed in Figure 7. The recorded electrical resistivities have been broadly interpreted in conjunction with the borehole data on the following basis:

Apparent Resistivity (Ohm-m)	Interpretation
80 - 275	Sandy Gravelly CLAY
275 - 550	Clayey Sandy GRAVEL
95 - 380	Shaley SANDSTONE
380 - 905	SANDSTONE

SEISMIC REFRACTION PROFILING

The seismic data, in conjunction with the ERT profiles and geological interpretations are displayed in Figure 7.

The data indicated three velocity layers that have been interpreted in conjunction with the borehole data on the following basis:

Layer	Seismic Velocity (m/s)	Average Seismic Velocity (m/s)	Interpretation	Stiffness/Rock Quality	Excavatability
1	278 - 400	350	Soil	Soft / Loose	Diggable
2*	1506 - 1800	1664	Soil	Stiff / Dense	Diggable
			Possible Highly-Moderately Weathered Bedrock	Poor	Marginally Rippable
3	3011 - 3198	3099	Slightly Weathered-Fresh Bedrock	Good	Break/Blast

* Note; Layer 2 velocities may be indicative of stiff to very stiff soil and/or highly to moderately weathered bedrock.

SUMMARY

Soil material has been interpreted as comprising sandy gravelly clay and clayey sandy gravel. The soil has been interpreted as ranging in thickness from c. 0m across part of the river bed to c. 2.0 – 3.6m thick away from the river. This formation should not present a problem for HDD.

Bedrock type has been interpreted as slightly weathered to fresh shaley sandstone and sandstone with a possible unconformable / faulted contact beneath the river bed. If the unconformity is tightly packed there should be little concern of fluid losses or borehole collapse.

Lateral variation in the bedrock resistivity values indicates contact between the two rock types, close to the southern bank of the river may be unconformable / faulted. However as both rock types are recorded as sandstone the likelihood of formation instability is unlikely.

Beneath the river bed the depth to the proposed directional drilling route is c. 5m, within interpreted slightly weathered – fresh bedrock, a positive result for HDD.

There is a good correlation between the interpreted depth to bedrock and the bedrock levels in the client supplied rotary borehole data.

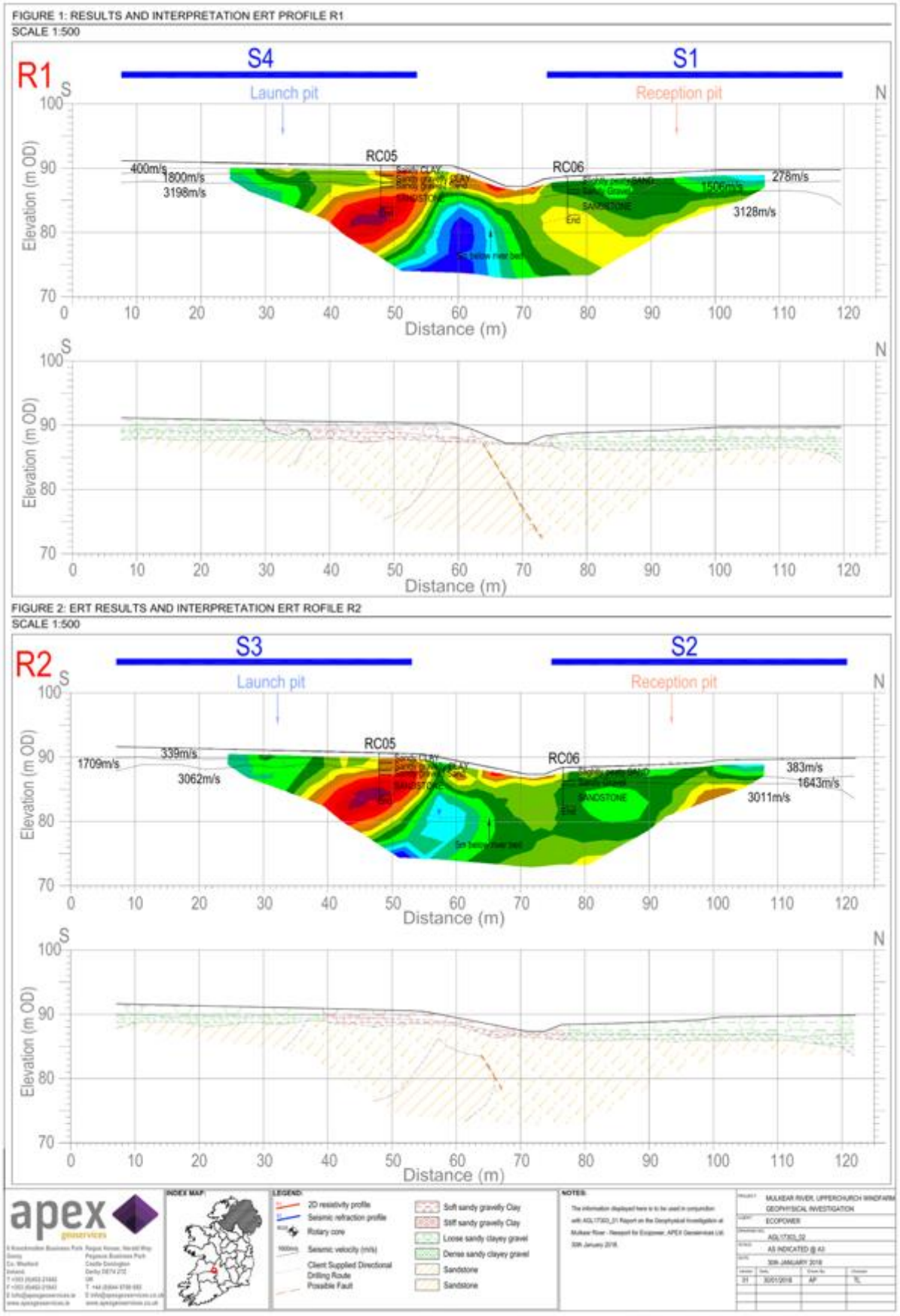

Figure 7 Geophysics results

HDD FRAC-OUT ANALYSIS

MULKEAR RVX

To understand why frac out calculations are not available for the Mulkear we must first understand the definition of a frac out. A frac out is defined as 'the unintentional return of drilling fluids to the surface during HDD'. Common causes include a restricted or blocked annulus created by a build-up of cuttings which requires mechanical agitation and fluid flow to re--suspend and remove the blockage. This situation is more likely to occur when drilling clays that are prone to plugging the borehole, bedrock chippings once suspended in the drilling fluids are easily removed.

A frac out occurs when:

a) The down hole mud pressure exceeds the overburden pressure (i.e. shallow or loose sections of the bore). A frac out is most likely to occur during the drilling of the pilot-hole at the entry and exit curves, when the depth of cover is shallow and the formation consolidation and confining strength are at a minimum. This is largely subjective to a combination of poor fluid selection for the geology encountered and poor drilling practices. One or both of these factors can lead to increased downhole pressure. If the pressure exerted by the overburden above the bore is less than the pressure exerted inside the bore, the fluid will seek to balance this pressure imbalance by taking the path of least resistance. This path is almost always going to be the ground surface. Due to the shallow depth of overburden on the Mulkear (bedrock outcropping beneath the river) this scenario does not apply.

or b) The fluid finds a preferential seepage pathway such as fault lines and fractures. These fractures can be natural or induced by over pressurising the formation. Although the results of the ERT survey beneath the Mulkear river show a dynamic geological structure the seismic results prove the formation is a competent fresh bedrock. The more competent the bedrock the less likelihood of seepage to surface.

The calculations used to evaluate frac out for the Bilboa and Clare RVX cannot be applied for the Mulkear as the calculations is based on standard penetration values, a value that is unobtainable in bedrock.

In summary the probability of a frac out/seepage on the Mulkear RVX is unlikely due to:

- the small hydrostatic head in the proposed HDD borehole,
- the five metre depth of cover beneath the river,
- the high seismic readings recorded in the geophysical survey,
- the fact the HDD borehole will be predominantly in a competent fresh sandstone,
- and the drill is relatively short, less than <100 metres in length.

BILBOA AND CLARE RVX

As both crossings are to be drilled through a fine-grained alluvium and glacial till calculations were performed in accordance with the guidance of Kennedy et al. (2004, 2006) and Xia and Moore (2007) to estimate the maximum allowable drilling fluid pressure, P_{max}.

Two modes of hydraulic fracture were considered:

1. Blowout (confined plastic flow)
2. Tensile fracture

Two river crossings were considered, and are shown in Table 1.

Table 1 River crossings considered

River crossing	Approx. length (m)	Anticipated ground conditions
Bilboa	35	Fine-grained alluvium and glacial till
Clare	36	Fine-grained alluvium and glacial till

For the Bilboa and Clare river crossings, the following assumptions were made based on the borehole logs, Appendix E:

- Drill path is through cohesive/fine-grained alluvium and glacial till. Insufficient detail exists to confirm depths of layers.
- Unit weight assumed as 18 kN/m^3 (BS 8002:2015).
- Undrained shear strength c_u = 5 SPT N (Clayton, 1995).
- Undrained shear strength increases with depth in accordance with Figure 8 and the equation c_u = 10 + 9z where z is metres below ground level.
- Coefficient of earth pressure at rest K_0 = 1.0 (Long & Menkiti, 2007).

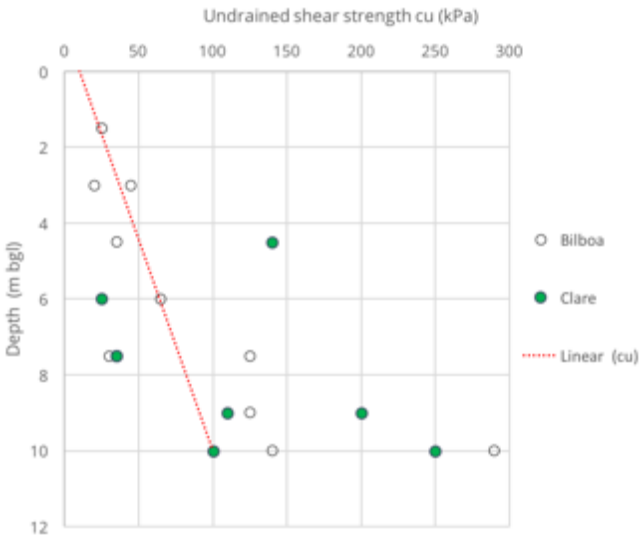

Figure 8 Undrained shear strength derived from SPT N values

In accordance with the method presented by Xia and Moore (2007), the predicted value of P_{max} was selected as the lesser of:

- $P_{max,1} = P_0(3K_0 - 1)$
- $P_{max,2} = 2c_u$

where P_0 is the initial overburden pressure and the other parameters are as given above.

Based on appraisal of the initial proposed drilling profiles, alternate drilling profiles (Appendix C) are suggested which allow for:

- A minimum of 2 metres of cover beneath the rivers.
- Entry angle of at least 11 degrees.

The resulting drilling profiles and values of maximum allowable drilling fluid pressure P_{max} to reduce the risk of hydraulic fracture for the Bilboa and Clare river crossings are presented in Figure 9 and Figure 10.

The avoid the possibility of a frac out it is very important that the selected drilling contractor applies good working practices which would include:

- Correct fluid pumping rates and allowing the fluid time to carry the cuttings to surface.
- Correct drilling fluids that are capable of building a filter cake, stop the formation from swelling, carry the cutting out of the borehole, and lubricate the pipe and tooling.
- Pre reaming if and when necessary.
- RPM and rate of penetration of the drill bits/reamers.
- Pipe pulling speeds.

It is equally important that the crew is competent and experienced being able to demonstrate that they have completed similar works.

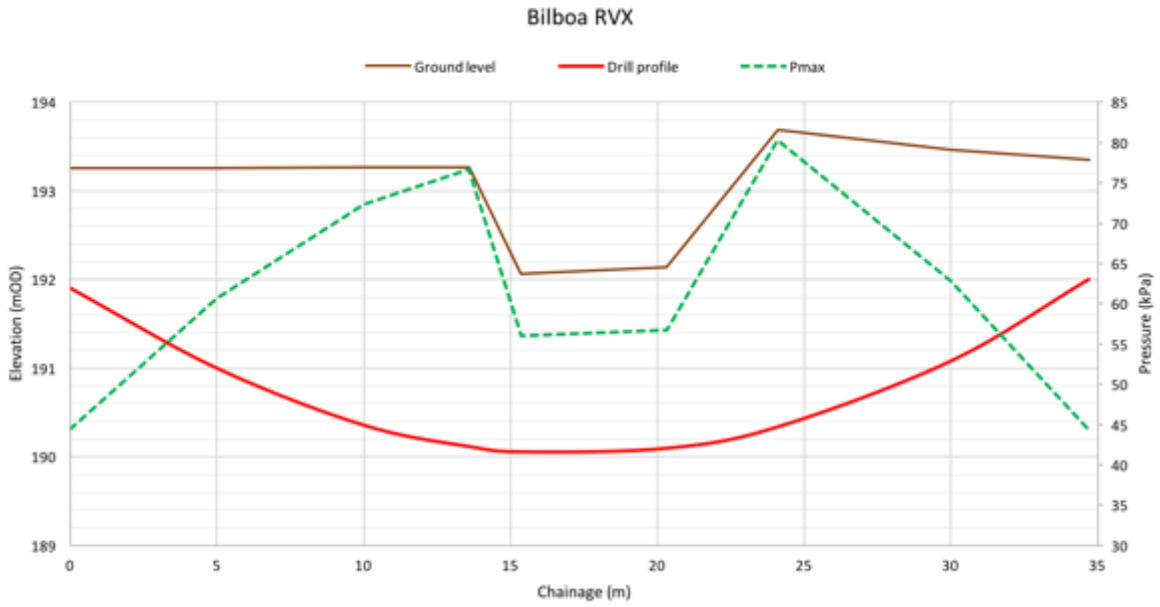

Figure 9 Bilboa river crossing profile and estimated maximum drilling fluid pressure, Pmax

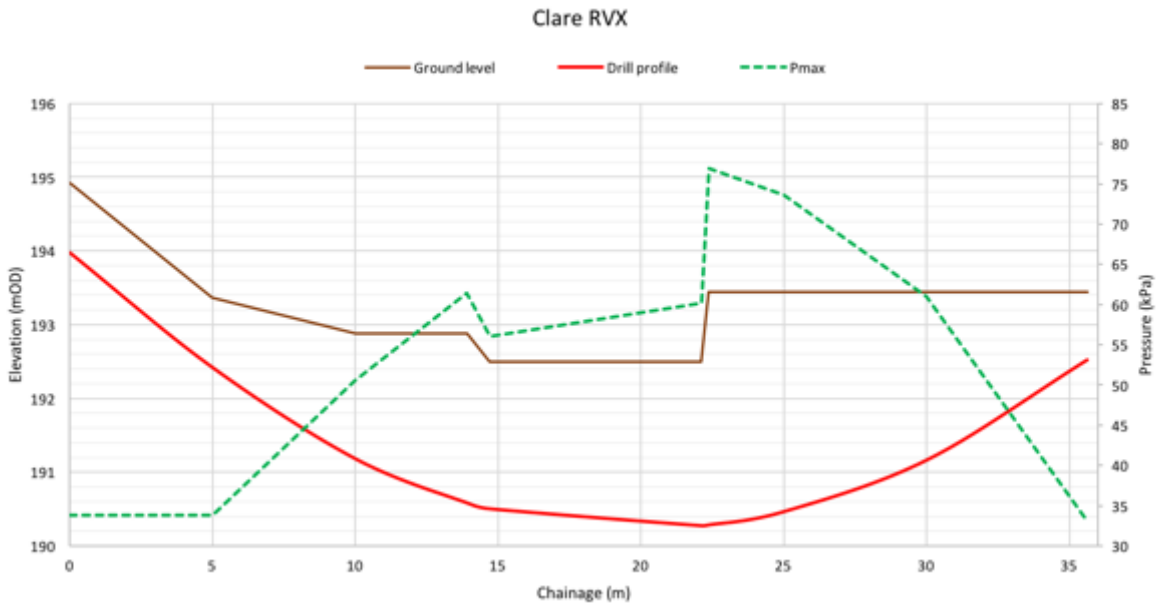

Figure 10 Clare river crossing profile and estimated maximum drilling fluid pressure, Pmax

BEST PRACTICES TO AVOID FRAC OUT

The works should be supervised and managed by a competent and experienced person who understands the technicalities and challenges of the project.

The success of HDD is closely linked to making sure that reamer and fluid selection fits the ground conditions. However, what is sometimes overlooked is the fact that we should also link good drilling practices with the reamer and drilling fluid selection, and managing correctly situations such as excessive downhole pressure build-up.

The drilling contractor should continually monitor the drilling fluid properties i.e. mud weight, viscosity, gel strength, volume and pressure, to prevent frac--outs.

Where necessary a pressure sub for real--time down hole pressure monitoring can be fitted into the bottom hole assembly allowing actual annular pressure readings to be obtained in real--time and then plotted against the modelled values.

If any unexpected variations or trends are observed then drilling should immediately cease and the cause investigated.

In all cases once punch out at exit point has been achieved, the annular pressure within the bore are relieved. Frac out during hole opening/reaming and pipe pulling operations is therefore much less likely to occur.

FRAC OUT CONTINGENCY PLAN

The purpose of a Frac-out Contingency Plan is to:

- Minimize the potential for a frac-out associated with horizontal directional drilling activities;
- Provide for the timely detection of frac-outs;
- Protect areas that are considered environmentally sensitive (streams, wetlands, other ecological resources, cultural resources);
- Ensure an organised, timely, and "minimum-impact" response in the event a frac-out and release of drilling mud occur.

To minimize the potential for a frac-out, a detailed Contingency Plan would include the following:

- Design protocols to be implemented for the protection of sensitive ecological receptors;
- Design protocols to require a geotechnical engineer or trenchless consultant to make recommendations regarding the suitability of the formations to be bored to minimize the potential for frac-out conditions (noting that the boreholes undertaken indicate that the HDD would not pass through fractured bedrock).
- Prior to drilling, sensitive ecological resources will be protected by implementing the following measures:
    - A walk-over survey will be conducted of the drilling entry and exit areas, surrounding work areas, and the drilling route (to the extent it is accessible) to ensure that there are no ecological receptors present.
    - If present, and dependent upon the sensitivity of the receptor, informed by relevant legislation, areas containing ecological receptors will be identified for avoidance or construction limits will be clearly marked;
    - Barriers (straw bales or sedimentation fences) will be erected between the bore site and nearby sensitive resources prior to drilling, as appropriate, to prevent released material from reaching the resource;
    - Toolbox talks will be conducted for the drilling crew to identify and locate sensitive resources at the site;
    - Ensure that all personnel understand their responsibility for timely reporting of frac-outs;
    - Maintaining necessary response equipment on-site or at a readily accessible location and in good working order;
- During operations the Mud Engineer will monitor fluid density, viscosity and solids content and any increases in pump pressure will be investigated immediately to prevent the risk of pressure build up within the annulus. Monitoring of fluid tank volumes will also be undertaken to identify any unexpected changes.
- Rates of Penetration and circulated cuttings volumes will be monitored to ensure that drilled cuttings are being flushed from the bore and are not building up creating pressure restrictions.
- Annular fluid velocity will be kept below Critical Velocity to prevent eddying and subsequent erosion caused by turbulent flow.
- When applicable a biodegradable drilling fluid should be selected such as Clear-Bore™

With the above measures in place Frac-out is considered unlikely to occur. However should in the event of a break-out the following recommendations may be included within the detailed Plan:

- In the event of break-out occurring in the river bed, the rig will immediately shut off the pumps and the drilling assembly will be pulled off bottom to reduce annular pressures.

- In the event of break-out on land an excavator will be made available to dig a pit to contain fluid with vacuum trucks/pumps available to transfer drill fluid from the containment point back to the recycling point.
- Drilling fluid additives design to plug the formation will be introduced to the circulation system and let set.

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APPENDIX A *MAPS*

Figure 11 – RVX locations for proposed HDD.

APPENDIX B: PREVIOUS SUCCESSFUL HDD PROJECTS COMPLETED BY GDS

NAME OF PROJECT: KNOCKAUNNANOON RIVER CROSSING FOR ESB

Year: 2015

Location: Knockaunnanoon, Co. Kerry

Client: ESB; Main Contractor, Reach Active.

Main project features: Design and install 5 x 125mm polyethylene ducts beneath a river along proposed cable routing from a windfarm. A combination of compressed air and mud rotary drilling techniques were utilized.

Positions held: Design, Project Manager and rig operator

Activities performed: Drafted HDD construction drawings, selecting both entry and exit locations, analysis of geotechnical information, and appropriate equipment selection. Drilled and installed.

Formation: Shale bedrock formation with a overlying boulder clay.

Reference: David Cleary, Senior Project Manager for Reach Active.

NAME OF PROJECT: LYRACRUMPANE RIVER CROSSING FOR ESB

Year: 2018

Location: Lyracrumpane, Co. Kerry

Client: ESB; Main Contractor, MDCE.

Main project features: Design and install a 125mm polyethylene ducts beneath the Smerlagh river along proposed cable routing from a windfarm. A mud rotary drilling techniques were utilized to drill the shale bedrock.

Positions held: Design engineering and project managment

Activities performed: Drafted HDD construction drawings, selecting both entry and exit locations, analysis of geotechnical information, and selection appropriate equipment. Drilled and installed.

Formation: Shale bedrock formation with a overlying boulder clay.

Reference: James Ireland, Michael Doyle Civil Engineering.

NAME OF PROJECT: ADSIL DUB56 ESB NETWORKS CABLE INSTALLATION

Year: 2017 - Present

Location: Ballycoolin, County Dublin

Client: Clifton Scammal Emerson and Associates and New Century Engineering Limited

Main project features: Assess the feasibility of completing sections of a new cable installation for the ESB using HDD. The deisgn involved installing 8 x 125mm polyethylene ducts beneath a river, Luas and roads including the M50.

Positions held: Design Engineer

Activities performed: Desk top study, Drafted HDD design drawings, analysis of geotechnical information, completion of trial HDD in Tymon park and geophysical survey, and selection of appropriate equipment. Tender review.

Formation: Limestone bedrock formation with a overlying boulder clay.

Reference: Leo McGinley, Operations Director for New Century Engineering Limited.

Note: Project is ongoing.

NAME OF PROJECT: ARKLOW OFFSHORE WINDFARM LANDFALL DUCT INSTALLATION

Year : 2002

Location : Arklow Pier, Arklow Town, Co. Wicklow.

Client : Airtricity, Main Contractor, Tristway

Main project features: Design and install a 315mm HDPE carrier duct from the pier into a water depth of 8 meters to facilitate the cable installation.

Positions held: Operations & Project Manager

Activities performed: Design and draft a methodology taking into consideration water depth, logistics, Health & Safety, Geotechnical data, Environmental constraints, Wireline steering tools, Drilling fluids, Working over water. Drilled and installed.

Formation: Soft silts, running sands and gravel

Reference: Paul Blount, Director of ABO Wind Energy

NAME OF PROJECT: M1 & M4 MOTORWAY CROSSINGS FOR APPLE GREEN SERVICE STATIONS.

Year : 2010

Location : Castlebellingham, Co. Louth ; Swords, Co. Dublin ; Enfield, Co. Meath

Client: Apple Green/NRA; Main Contractor: Pierce Contracting

Main project features: Design and install multiple utilities beneath a live motorway to interlink the new service stations using horizontal directional drilling. Wireline steering technology was utilised to mitigate the necessity for personnel on the carriageway.

Positions held: Project manager and Director

Activities performed: Strategic Planning, analysis of geotechnical data, draft construction drawings, and risk assessed. Drilled and installed.

Formation: Stiff black boulder clay.

Reference: Client has ceased trading.

NAME OF PROJECT: NORTH-SOUTH GAS PIPELINE.

Year : 2006

Location: Moira, Co. Antrim.

Client: Bord Gais.

Main Contractor: Lagan/Ferrovial

Main project features: Design and install a 450mm heavy wall high pressure steel gas main beneath the M1 motorway west of Belfast. Steering technique was a Para trak 2 wireline guidance system.

Positions held: Project Manager and Director.

Activities performed: Designed the profile of the crossing based on the parameters of the product pipe. Managed the operations of the project.

Formation: A conglomerate of Mercia Mudstones and Sherwood sandstones.

Reference: Niall McGuinness, Vantage Three Limited.

NAME OF PROJECT: RIVER CROUCH CROSSING.

Year : 2006

Location : Hullbridge, Hockley SS5 6ND, UK.

Client: Essex & Suffolk Water.

Contractor: M.Holleran Civil Engineering

Main project features: Design and install a 450mm HDPE watermain beneath a tidal estuary. Steering technique was a walk over guidance system. Due to the reactive formation and site constraints, two rigs were mobilised for the project, allowing reaming and pulling the pipe to take place on opposite sides of the river.

Positions held: Project Manager and Director.

Activities performed: Contract geotechnical drilling contractor to sample and analysis the formation. Reviewed the data and drafted a methodology taking into consideration the formation risks. Managed the project.

Formation: Swelling London Clays.

APPENDIX C *SOURCE DATA FOR GRAPHS*

Bilboa						
Chainage	Elevation	Drill path	Cover	Pmax,K0	Pmax,cu	Pmax
m	m	m	m	kPa	kPa	kPa
0	193.26	191.9	1.36	48.96	44.48	44.48
5	193.26	191	2.26	81.36	60.68	60.68
10	193.27	190.36	2.91	104.76	72.38	72.38
13.58	193.27	190.12	3.15	113.4	76.7	76.7
15.35	192.06	190.06	2	72	56	56
20.31	192.14	190.1	2.04	73.44	56.72	56.72
24.1	193.69	190.34	3.35	120.6	80.3	80.3
30	193.46	191.08	2.38	85.68	62.84	62.84
34.71	193.35	192	1.35	48.6	44.3	44.3

Clare						
Chainage	Elevation	Drill path	Cover	Pmax,K0	Pmax,cu	Pmax
m	m	m	m	kPa	kPa	kPa
0	194.92	193.98	0.94	33.84	36.92	33.84
5	193.36	192.42	0.94	33.84	36.92	33.84
10	192.88	191.18	1.7	61.2	50.6	50.6
13.91	192.88	190.58	2.3	82.8	61.4	61.4
14.7	192.5	190.5	2	72	56	56
22.11	192.5	190.27	2.23	80.28	60.14	60.14
22.37	193.44	190.28	3.16	113.76	76.88	76.88
25	193.44	190.46	2.98	107.28	73.64	73.64
30	193.44	191.16	2.28	82.08	61.04	61.04
35.62	193.44	192.52	0.92	33.12	36.56	33.12

APPENDIX D *PROFILE DRAWINGS*

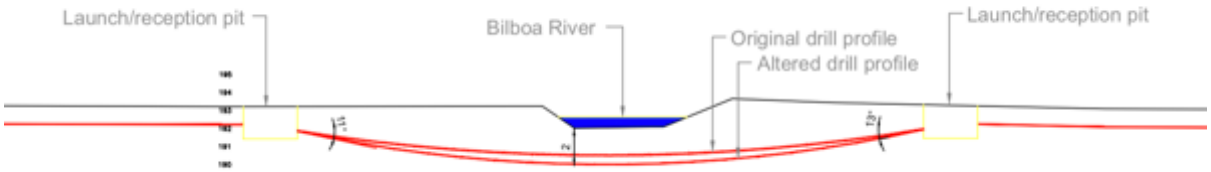

Figure 12 – Bilboa RVX suggested profile.

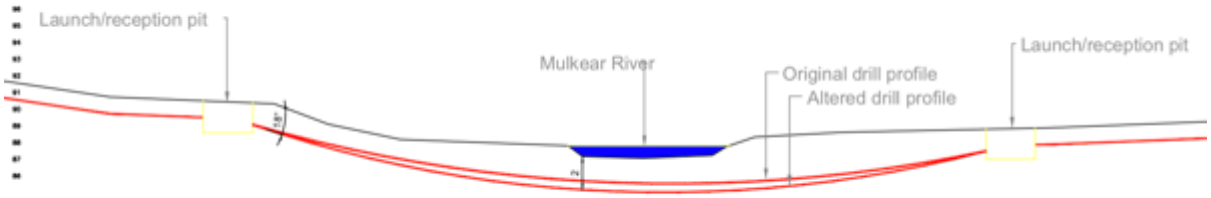

Figure 13 – Mulkear RVX suggested profile.

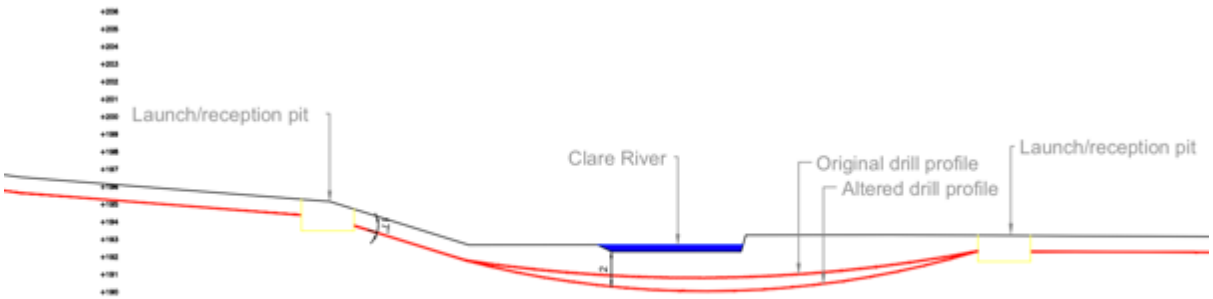

Figure 14 – Clare RVX suggested profile.

APPENDIX E: BOREHOLE LOGS

Priority Geotechnical Ltd.
Tel: 021 4631600
Fax: 021 4638690
www.prioritygeotechnical.ie

Drilled By:	Borehole No.
GW	**RC05**
Logged By:	Sheet 1 of 1
AH	

Project Name:	Upperchurch Windfarm	**Project No.** P16074	**Co-ords:**	**Hole Type** RC
Location:	Upperchurch Windfarm, Co Tipperary.		**Level:**	**Scale** 1:50
Client:	Ecopower		**Date:**	19/05/2016 -

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.60			Open hole boring. Driller described: Sandy Clay.
		1.50	SPT	N=45 (6,8/13,10,10,12)	1.60			Open hole boring. Driller described: Sandy gravelly Clay.
					2.70			Open hole boring. Driller described: Gravel.
		3.00	SPT	0 (75 for 20mm/0 for 0mm)	3.00			Open hole boring. Driller described: Sandy Gravel with boulder content.
	▼				3.40			Open hole boring. Driller described: Sand with boulder content.
		3.60	SPT	0 (75 for 2mm/0 for 0mm)	3.60			Open hole boring. Driller described: Rock. Assumed Sandstone.
								Lithology: Weak to moderately weak, dark red, fine to medium grained SANDSTONE with cross bedding and carbonaceous deposits. Weathering: Slightly weathered with orange oxidation colouration, clay smearing on fracture surfaces and minor loss of strength in part. Fracturing: 2 apparent sets. Set 1 dipping 15 degrees with planar smooth to planar rough fracture surfaces and close spacing. Set 2 is dipping 30 to 40 degrees with undulating smooth to undulating rough fracture surfaces and close spacing.
								Non-intact.
								Carbonate calcretes, 2cm dia.
								Cross bedding.
					6.60			End of Borehole at 6.60m

1 2 3 4 5 6 7 8 9

Groundwater:

Struck	Rose to	After	Sealed	Comment
3.40				See shift data.

Hole Information:

Hole Depth (m)	Hole Diameter (mm)	Casing Diameter (mm)
6.60		

Equipment & Methods: Deltabase 520.

Remarks:

Borehole terminated ta 6.60m bgl.

Shift Data:

Groundwater	Shift	Hole Depth	Remarks
	19/05/2016 08:00	0.00	Start of shift.
3.4	19/05/2016 18:00	6.60	End of borehole.

Priority Geotechnical Ltd.
Tel: 021 4631600
Fax: 021 4638690
www.prioritygeotechnical.ie

Drilled By:	Borehole No.
GW	**RC06**
Logged By:	Sheet 1 of 1
AH	

Project Name:	Upperchurch Windfarm	**Project No.** P16074	**Co-ords:**	**Hole Type** RC
Location:	Upperchurch Windfarm, Co Tipperary.		**Level:**	**Scale** 1:50
Client:	Ecopower		**Date:**	20/05/2016 -

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
		1.50	SPT	N=6 (2,1/1,1,2,2)				Open hole boring. Driller described: Slightly peaty Sand.
					2.10			Open hole boring. Driller described: Sandy Gravel.
	▼				2.70			Open hole boring. Driller described: Rock. Assumed Sandstone.
		3.00	SPT	0 (75 for 0mm/0 for 0mm)	3.00			Lithology: Weak to moderately strong, thinly laminated dark red, fine to medium grained SANDSTONE with carbonaceous rich laminae. Weathering: Slightly weathered with minor orange oxidation colouration, apparent loss of strength in part, surface colour bleaching and clay smearing on fracture surfaces. Fractures: 1 apparent set dipping 0 - 10 degrees with planar smooth to planar rough fracture surfaces and close to very close spacing. *Carbonaceous calcretes.*
					6.00			End of Borehole at 6.00m

1 2 3 4 5 6 7 8 9

Groundwater:

Struck	Rose to	After	Sealed	Comment
2.80				See shift data.

Hole Information:

Hole Depth (m)	Hole Diameter (mm)	Casing Diameter (mm)
6.00		

Equipment & Methods: Deltabase 520.

Remarks:

Borehole terminated at 6.00m bgl.

Shift Data:

Groundwater	Shift	Hole Depth	Remarks
	20/05/2016 08:00	0.00	Start of shift.
2.8	20/05/2016 18:00	6.00	End of borehole.

Whole Upperchurch Windfarm Project

Natura Impact Statement
for
Whole UWF Project Elements 1 to 5

May 2018

APPENDIX A18:

VEGETATION REINSTATEMENT METHODOLOGY ALONG CONCEALED ACCESS ROADS FOR UWF GRID CONNECTION

INIS Environmental Consultants Ltd
Planning and Environmental Consultants

Produced by INIS Environmental Consultants Ltd., Suite 11, Shannon Commercial Properties, Information Age Park, Gort Road, Ennis, Co. Clare
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UWF Grid Connection EIA Report

Volume C4: EIAR Appendices

Appendix 5.8

Vegetation Reinstatement Methodology along Concealed Access Roads

for

UWF Grid Connection

(Adapted from SNH Guidelines and incorporating refinements by Dr. Watson on best practice for the construction and revegetation of Vehicle Hill Tracks in Scotland)

Dr. Mary O'Connor, Peatland Ecologist

May 2018

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2. Overview of the Proposed New Concealed Access Roads 4
3. Methodology for Establishment of Vegetation on Concealed Access Roads and Road Margins 6
3.1. General Approach to the planting of the heather/grass Concealed Access Roads NR9, NR10, NR16, NR17 7
3.2. Detailed methodology relating to planting of the heather/grass Concealed Access Roads NR9, NR10, NR16, NR17 10
3.3. Methodology relating to the revegetation of the roadside berms and road margins for NR9, NR10, NR16, NR17 15
3.4. Methodology relating to the planting of grass Concealed Access Roads NR7, NR8, NR12, NR14, NR15, NR20 16
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APPENDIX 1 – Relevant sections adapted from Scottish Natural Heritage-Information and Advisory Note Number 44 *Heather re-establishment on mechanically-disturbed areas*

APPENDIX 2: Example of Successful Heather Reestablishment in Cutover Forestry Site
CASE STUDY 14: RAE FARNBOROUGH, HAMPSHIRE

APPENDIX 3: Example of successful heather establishment

Vegetation Reinstatement Methodology along Concealed Access Roads

1. Introduction

This report, by Dr. Mary O'Connor, was commissioned by Ecopower Developments and relates to proposed Concealed Access Roads which are part of the design of the proposed UWF Grid Connection project.

Dr. Mary O'Connor is a Peatland Ecologist with a PhD in Blanket Bog Ecology and Geochemistry and 20 years experience as a consulting ecologist, working on peatland and upland habitats.

The UWF Grid Connection project will comprise a new substation at Mountphilips and c.27.5km of 110kV Underground Cables (110kV UGC) between the new Mountphilips Substation on the western side of the Slievefelim/Silvermines upland area to the consented Upperchurch Windfarm Substation which is located in the eastern extents of this upland area. The UWF Grid Connection will also include the construction of sections of new access roads which are required to provide access for ESB Networks to the Joint Bays which are located at intervals along the 110kV Underground Cables (110kV UGC).

The 110kV UGC and associated access roads are routed across the Slievefelim to Silvermine Mountains SPA. Within the SPA, it is proposed to use Concealed Access Roads instead of standard stone roads, in order to:

- ensure no loss of vegetation cover associated with the UWF Grid Connection within the SPA,
- ensure access to the Joint Bay locations during the operation of the UWF Grid Connection by ESBN,
- continue to provide a suitable vegetation cover in relation to the hen harrier bird.

Concealed Access Roads will comprise the covering of standard stone access roads with a vegetated layer of heather and grasses. Concealed Access Roads will be constructed along all new sections of access road which are located within the Slievefelim to Silvermine Mountain SPA.

This reports provides a methodology for the successful creation of the vegetated layer on these Concealed Access Roads. The methodology proposed is based on a number of best practice methods, in particular the Scottish Natural Heritage Information and Advisory Note Number 44 *Heather re-establishment on mechanically-disturbed areas* (see Appendix 1 for extracts) and the best practice method outlined in *Vehicle Hill Tracks in Northern Scotland* (Wastson, A. 2011) and Bord na Móna, field trials for heather reestablishment and revegetation of disturbed peatland sites, see APPENDIX 3 for examples of successful heather establishment trials (Dr. M. McCorry pers comm.). A case study on successful heather reestablishment in a cutover forestry site **CASE STUDY 14: RAE FARNBOROUGH, HAMPSHIRE** is included as Appendix 2. The methodology described in this report can be considered as best practice for establishment of heather at altitude.

During the course of preparing this report, the following desktop and fieldwork was carried out:

- a review of best practice methods,
- the current and natural (in the case of forestry) land cover at the Concealed Access Road locations was examined to identify the appropriate planting treatment at each Concealed Access Road location,
- the results of trial pit investigations along the UWF Grid Connection were reviewed for the soil type and depths at each Concealed Access Road location,
- a review of the outline construction methodology for the construction of new roads,
- Contour mapping, provided by the developer, was also examined to establish the elevation of the Concealed Access Roads,
- A representative section of stone road was set up, and 'concealed' with a heather and grass mix, to confirm the methodology to be used during construction works at the UWF Grid Connection.

2. Overview of the Proposed New Concealed Access Roads

There are 10 individual sections of Concealed Access Roads proposed within the Slievefelim to Silvermine Mountain SPA. These roads are identified on Table 1 below. In areas of forestry, the soils generally comprise peat soils and in these locations the vegetation of the Concealed Access Roads will be with heather plants and grass nurse species. In grassland sections of the 110kV UGC, the soils under the locations of the Concealed Access Roads are generally mineral soils or thin peaty topsoils, in these areas the vegetation of the Concealed Access Roads will be with upland grasses.

Table 1: Location, soil type, peat depth and proposed treatment regime for Concealed Roads

Road ID	Townland	Land Cover	Trial Pit (TH) or Peat Probe Soil Type & Peat Depth	Concealed Road Length	Elevation (ASL)	Planting Treatment
NR7	Castlewaller	Grass Field	TH 28 Sandy Silt Mineral soil	320m	140m a.s.l.	Grasses
NR8	Castlewaller	Forestry (to be felled)	TH 25 Peaty Topsoil	10cm	180m a.s.l.	Grasses and possibly Heather depending on surrounding vegetation
NR9	Castlewaller	Forestry (to be felled)	TH 38 Peat Probes 74-96 Peat 1.5m - 2.75m	700m	305 a.s.l.	Heather with Grass nurse
NR10	Knockacullin	Firebreak	TH19 Peat Probes 97-114 0.5m peat	110m	210 a.s.l.	Heather with Grass nurse
NR12	Bealaclave	Grass Field	TH 35 Mineral soil Humic layer and silt/clay	30m	200 a.s.l.	Grasses
NR14	Baurnadomeeny	Grass Field	TH14 Peaty topsoil	30m	260 a.s.l.	Grasses and possibly Heather depending on surrounding vegetation
NR15	Baurnadomeeny	Grass Field	TH13 Peaty topsoil	40m	290 a.s.l.	Grasses and possibly Heather depending on surrounding vegetation
NR16	Goulmore	Forestry (to be felled)	TH 12 Mineral soil	280m	310 a.s.l.	Grasses and possibly Heather depending on surrounding vegetation
NR17	Laghile	Forestry (to be felled)	TH 10 Peaty topsoil	30m	320 a.s.l.	Heather with Grass nurse

NR20	Knocknabansha	Grass Field	TH 5 Humic layer over Clay Silt	50m	280 a.s.l.	Grasses

There are no slopes greater than 30 degrees at the Concealed Access Road locations and soils are generally thin mineral or peaty topsoils. The Concealed Access Road NR9 at Castlewaller/Killeen is through an area of deeper peat (1.5m - 2.75m), the new access road (NR9) in this location will be of a floating construction and laid over peatland in the forestry areas of Castlewaller, see Figures GC 5.16 and GC 5.16 of Volume C2 EIAR Figures.

This report is principally concerned with the re-establishment of ling heather (*Calluna vulgaris*).The report further comments on the re-establishment of grasses over non floating roads, through hill farms in the development area.

3. Methodology for Establishment of Vegetation on Concealed Access Roads and Road Margins

The methodology provided in this section relates to the Concealed Access Roads identified in Table 1 above.

The two methodologies which will employed are:

1. Nursery production of heather and grasses and planting-out into geocell material, and
2. The use of intact blocks of soil and plant cover along road margins with supplementary planting/seeding.

The methodology to be implemented is presented as follows:

- The general approach to the planting of the heather/grass Concealed Access Roads NR9, NR10, NR16, NR17
- A detailed methodology relating to planting of the heather/grass Concealed Access Roads NR9, NR10, NR16, NR17
- Methodology relating to the revegetation of the roadside berms and road margins NR9, NR10, NR16, NR17
- Methodology relating to the planting of grass Concealed Access Roads NR7, NR8, NR12, NR14, NR15, NR20
- Biosecurity Measures, and
- Monitoring Requirements.

3.1. General Approach to the planting of the heather/grass Concealed Access Roads NR9, NR10, NR16, NR17

One of the important methods for successful survival of heather plants is that especially on slopes and at higher altitudes, **heather should be planted with a grass nurse,** as the grass nurse species will provide additional shelter to the heather plants and will reduce the exposure of the heather plants to wind and erosion and this will aid in the successful growth and survival of the heather plants.

According to Scottish Natural Heritage best practice (see Appendix 1) , the planting density should be at least 9 plants per m^2 which is about the minimum to achieve reasonable coverage in less than five years: In order to achieve adequate levels of coverage with immediate effect after planting along the Concealed Access Roads NR9, NR10, NR16 and NR17, the planting density of heather is proposed to be 30 native heather plants per m^2, with an additional 10 native grass plants per m^2 as the nurse species. This will provide an excellent level of expected survival and cover. The heather will be planted in patches within a grass matrix at a ratio of circa 75:25 heather to grass, therefore in addition to the 30 heather plants, 10 grass plants will be planted per m^2 as the nurse species. In total there will be **40 plants per square metre**.

According to the Site Synopsis for the Slievefelim to Silvermines Mountains SPA 'much of the site is over 200m in altitude and consists of a variety of upland habitat. The bog and heath vegetation includes such typical species as Ling Heather (*Calluna vulgaris*), Bilberry (*Vaccinium myrtillus*), Bell Heather (*Erica cinerea*), Common Cottongrass (*Eriophorum angustifolium*), Hare's-tail Cottongrass (*Eriophorum vaginatum*), Deergrass (*Scirpus cespitosus*) and Purple Moor-grass (*Molinia caerulea*). The remainder of the site is mostly rough grassland that is used for hill farming. **The heather species which will be planted in the Concealed Access Roads is Ling Heather (*Calluna vulgaris*), while the grass nurse species which will be used is *Agrostis capillaris,*** *a typical upland grass species. Anthoxanthum odoratum* and *Festuca ovina* grasses, and *Holcus lanatus*[1] heather have also been used on upland sites with success.

Timing of planting out is important. An early start gives plants the maximum time to develop the root system before winter. However, May is often dry and there is a consequent risk of plants dying, therefore late June may be the optimum.

For the UWF Grid Connection Concealed Access Roads, it is proposed that the heather and grass plants will be grown in nurseries off-site and then planted as mature plantlets into the geocell material. **The planting of the geocell material with the mature plantlets will be carried out ahead of the construction works to allow the plants time to establish within the geocell** before being transferred to the Concealed Access Road locations and laid on top of the stone roads. The planting of the geocell material offsite will minimise disturbance to the plants during the construction of the Concealed Access Roads and will allow the concealing of the new stone access roads to take place at any time during the year.

In order to ensure that the heather plants have adequate root space, the new stone access road will be vegetated using a **double layer of load bearing geocell material** with a total depth of 150mm and a 20mm layer of peat which will be spread under the double geocell layer. This will provide **an overall rooting depth**

[1] http://www.heathertrust.co.uk/reading-room

of 170mm which will be sufficient to protect the rooting zone of the heathers from any vehicular traffic and will optimise the survival and growth of the plants on the new Concealed Access Roads.

The geocells are permeable to water and will allow both horizontal and veritcal water movement, this will ensure that water logging of the rooting zone of the heather, which could prevent vegetation establishment, will not occur.

A rockfill layer, comprise 70:30 angular stone to peat will be laid underneath the geocell/peat layer. This rockfill layer will provide the plants with an additional peat rootzone space whilst further avoiding waterlogging of the geocells. The rootzone mix of stone and peat has been developed by Cornell University (Wales) and is a useful means of providing soil to plant roots while maintain structural load-bearing qualities.

The stone roads will be overlain with an open texture geotextile material, which will be laid under the rockfill layer. A double layer of the rigid geocells will be laid over the rockfill layer. This **geotextile material together with the rigid structure of the geocells will prevent the erosion of peat** on the Concealed Access Roads and will **provide stable peat soils which will promote the growth of the heather and grasses**.

To assist growth a compound fertilizer will be applied to the first layer of peat-filled geocells, before the planted second layer of geocells is overlaid. This fertilizer will assist in the successful growth of the Concealed Access Roads. A fertilizer will also be spread over the top layer of geocells as they are laid on the Concealed Access Roads.

It is recommended that for the first 18 months there will be very limited (if any) vehicular use of the Concealed Access Roads NR9, NR10, NR16 and NR17 to allow bedding in and establishment of the vegetation on the geocell road surfaces. To protect these concealed roads, unauthorised access will be prevented through erection of secure fencing and locked gates at either end of each of these Concealed Access Roads.

3.2. Detailed methodology relating to planting of the heather/grass Concealed Access Roads NR9, NR10, NR16, NR17

The new Concealed Access Roads in Castlewaller and Killeen (NR9), Knockacullin (NR10), Goulmore (NR16) and Laghile (NR17) will be vegetated with mature heather and grass nurse plants. The methodology which will be employed on these roads is detailed below.

1. UK Forestry Commission recommends utilizing vegetation and brash to help to reduce the amount of stone needed to create trackways in cutover forestry on peat soils. Sitka Spruce brash is ideal for this, particularly if long tops are laid across the track in what is often called "corduroy" style. At NR9 the new floating road will incorporate the brash from the trees felled along the corridor of the 110kV UGC in Castlewaller/Killeen. The long tops, as well as the upturned root plates of trees, will be laid across the footprint of the floating road in the 'corduroy' style. The remaining Concealed Access Roads will be of standard 'excavate and flil' construction.

2. As per the picture below, an open texture geotextile material will be laid over the new stone road.

3. A layer of rockfill will then be laid on top of the geotextile material and compacted. This rockfill layer will comprise a 70:30 mix of angular stone to peat. The stone will be sourced from the local Rear Cross quarry and will be a good match to the local geology to prevent changes to peat pH. This stone/peat rootzone layer will form the base for the placement of the geocell layers.

4. To ensure an adequate rooting depth a layer of peat 20mm thick is placed over the rockfill layer of stone/ peat.

5. Geocells with a rigid open cell structure (such as the geocell shown in the photo below) will be then laid over the peat and rockfill layer. The geocells will have open passageways lower down to facilitate root growth and the passage of water. The blocks of geocells will be laid over the peat and rockfill layer and interlocked to each other. Each of the geocell blocks used in the photos below are 50cm x 50cm. .

6. The first layer of geocell will be filled with peat, and lightly compacted, and a layer of a slow release ericaceous fertiliser will be applied.

7. The pre-planted geocells will then be laid on top of the first layer of geocells. This second layer of geocell blocks will be interlocked with each other, and some fertilizer will be spread over the top. As each 10m section is completed, the new section of Concealed Access Road will be watered if required.

8. A demonstration of the resultant vegetated Concealed Access Road is shown in the photos below, planted with Ling Heather (*Calluna vulgaris*) plants and nurse grasses.

Ground level and aerial views of demonstration 8m long Concealed Access Road

9. The vegetation of the heather/grass Concealed Access Roads NR9, NR10, NR16 and NR17 will be overseen by a competant peatland ecologist.

3.3. Methodology relating to the revegetation of the roadside berms and road margins for NR9, NR10, NR16, NR17

The clearfelled margins alongside Concealed Access Roads NR9, NR10, NR16 and NR17 will be revegetated using a heather and grass nurse mix. The following methodology will be employed during reinstatement works:

1. During felling, the peat turfs between the trees will be left intact as far as possible, and any turves excavated or removed from the surface will be stored for later reinstatement, these turves will be covered to prevent desiccation during dry spells and watered as neccessary, the process will be carried out as quickly as possible so that any sods for reuse will replaces along route as quickly as possible.
2. An upslope drain will be installed to divert surface drainage flow away from the replanted/reseeded areas.
3. Ground limestone at 250 g and compound fertiliser (20N:20P:20K) at 30 - 40 g per m2, plus additional ground mineral phosphate at 100 g per m2, will be applied and raked into the surface of the berms and clearfelled areas before planting and seeding of heather and grass nurses.
4. Any previously stored peat turves, will be laid in a matrix along the reinstatement area – particularly on the sides of berms and on sloping ground. The areas between the turves will then be planted and seeded with native heather (*Calluna vulgaris*) and grass nurse species.
5. The roadside berms and clear felled margins will be planted with mature native heathers to obtain a density of at least 9 heather plants per metre (as per SNH best practice), mature upland grass nurses will also be planted through the heather at a ratio of circa 75:25 heather to grass. Therefore the total planting density will be 12 plants per metre squared. In addition to the mature plants, the roadside berms and clearfelled margins will be seeded with a native heather and upland grass seed mix.
6. Brashings from the felled forestry will be laid over the berms and clearfell area to make an open lattice. The use of brashing has been shown to inhibit the movement of surface soil in wind and rain. Brashings will be laid flat as far as possible with gaps of 10 -15 cm between each twig. Pegging down will be carried out as required to prevent the movement of brashings during winter storms Liquid stabilising agents will not be used as they can inhibit plant establishment.
7. The vegetation of the berms and clearfelled road margins of Concealed Access Roads NR9, NR10, NR16 and NR17 will be overseen by a competant peatland ecologist.

3.4. Methodology relating to the planting of grass Concealed Access Roads NR7, NR8, NR12, NR14, NR15, NR20

The new Concealed Access Roads in Castlewaller (NR7 and NR8), Bealaclave (NR12), Baurnadomeeny (RF14, NR15) and Knocknabansha (NR20) will be vegetated with mature grass plantlets. The Concealed Access Roads through grassland will be resodded and reseeded with a native upland grass mix appropriate to the adjacent vegetation. The methodology which will be employed on these roads is detailed below.

1. During the initial construction of the stone access road, the top sod will be carefully removed and stored for later use on top of the access road and road margins. Sods will not be stacked, and will be covered in dry weather to prevent desiccation. During the removal of soils, the topsoil layer will be stored seperately to subsoil layers.
2. Once the construction of the concealed road is completed, reinstatement works will commence immedately to replace the sods on the concealed road, roadside berms or road margins .
3. Prior to the replacement of the sods, the subsoil will be relaid, levelled and firmed to the correct density to promote the even settlement of replaced top sods and turfs.
4. The previously removed topsods will be placed on the prepared soil, butted close, and firmed to ensure that voids do not remain Any unavoidable gaps will be filled with topsoil, and seeded.
5. Large patches of bare ground will be planted with mature grass plantlings and, in addition, will also be seeded with an appropriate grass seed mix. This will ensure a continuous vegetation cover at the site.
6. All reinstatement works will be overseen by a competent ecologist.

3.5. Biosecurity Measures

1. The Provenance and Source of planting material will be clearly outlined,
2. Only a reputable nursery which employs plant health surveillance measures will be used,
3. The biosecurity control measures which the nursery employ will be kept on record,
4. The plants will be inspected on a regular basis for good health, and will be checked again on delivery. Any plants in ill-health will be rejected.
5. All material and packaging associated with the delivery of the plants will be checked for invasive alien species.
6. Once planted in the geocells, the new plantings will be regularly checked for any signs of ill health, pests or disease, or any occurrence of invasive species.

3.6. Site Monitoring

1. During construction works, a competent ecologist (peatland ecologist at NR9) will supervise the removal and storage of the top-sod or turves from the footprint of Concealed Access Roads,
2. All vegetation works on Concealed Access Roads and all revegetation works on roadside berms and road margins will be overseen by a competent ecologist, who will be a competent peatland ecologist at Concealed Access Road NR9.
3. The new Concealed Access Roads will be monitored monthly, or after any periods of exceptional or severe weather such as periods of extreme rainfall or cold, during the establishment phase of the plantings (first 18 months). This initial monitoring will evaluate soil conditions and plant health and will include the carrying out of any remedial measures required by the peatland ecologist during their bi-annual condition monitoring survey. Remedial measures will include applying a top-dressing of peat and the application of a slow-release fertilizer.
4. The condition of the Concealed Access Roads will be monitored on a bi-annual basis until the end of Year 6 of the operational stage. This condition monitoring will be conducted by a competent peatland ecologist, who will evaluate the following in particular; the amount of Residual Bare Ground, the Vegetation Composition and Structure (inc. forb cover) and any Indicators of Negative Trends.
5. Following condition monitoring, the peatland ecologist will inform the developer of any remedial action required, and will oversee the carrying out of any remedial measures at the cost of the developer.
6. The peatland ecologist will also prepare an annual condition monitoring report, following the completion of surveys during Years 1 to 6 inclusive. These reports will document the success of the vegetative planting of the Concealed Access Roads, berms and road margins, including details of remedial measures which were implemented during the preceeding year.
7. It is considered that with monitoring and responsive remedial measures, that the heather and grasses will have succesfully established and will not be prone to erosion or frost heave by the end of year 6 and therefore will not require any further monitoring.

3.7. References Consulted

Anderson, P., J. Walker & M. Buckler (2008) Moorland restoration – potential and progress. In: Bonn, A., T. Allott, K. Hubacek & J.

Buckler, M., J. Walker & A. Bonn (2008) Bare Peat Restoration on Peak District Moorlands: Nurse Crop Establishment and Plant Succession. Moors for the Future Report No. 14, Edale.

Scottish Natural Heritage Information and Advisory Note Number 44 *Heather re-establishment on mechanically-disturbed areas Rehabilitation*

Shellswell, C.H., Chant J.J., Alonso, I., Le Bas, B., Edwards, J. and Parton, C. (2016) *Restoration of existing lowland heathland -timescales to achieve favourable condition. Plantlife, Salisbury.*

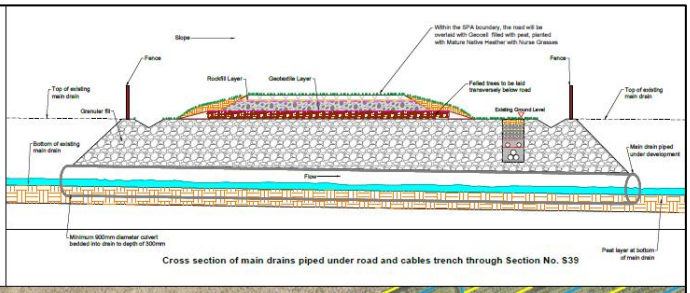
Walker, J., J. Holden, M. G., Evans, F. Worrall, S. Davison & A. Bonn (2008) A compendium of UK peat restoration and management projects. Final report to Defra, project code SP0556

Watson, A. (2011) *Vehicle Hill Tracks in Northern Scotland*

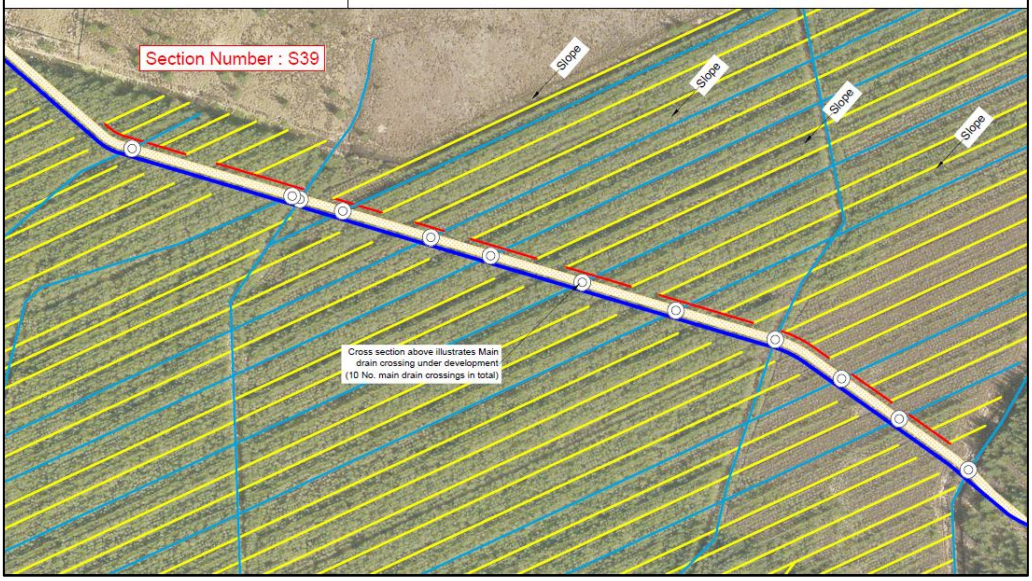
FIGURES & DRAWINGS

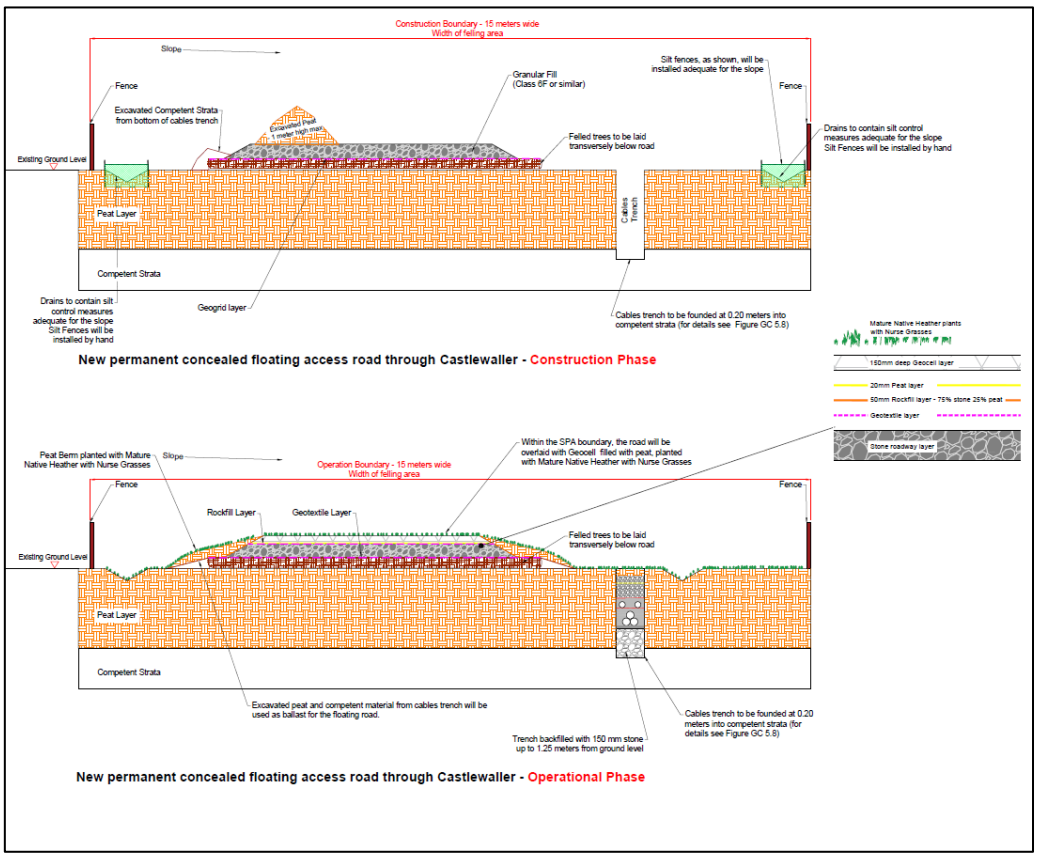
Description of the works:

Minor drains will be connected to the culverted main drains upslope of the works by excavating **interceptor drains** parallel to the works so water flows from the **minor drains** into the **main drains** then under the floating road and grid connection works area. This will prevent any ponding of water upslope of the works and avoid water coming into contact with any sediment from the works.



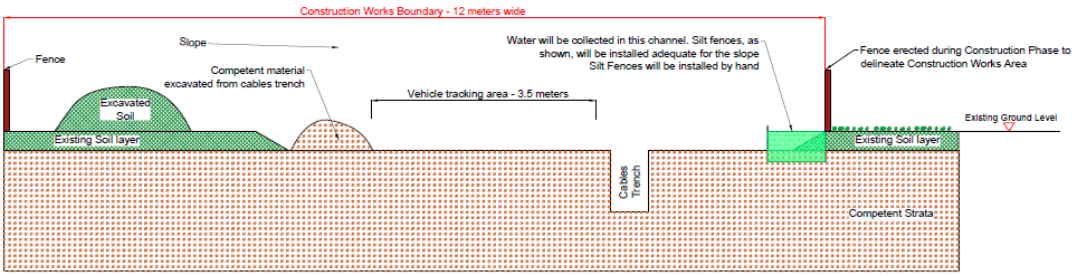
Cross section of main drains piped under road and cables trench through Section No. S39



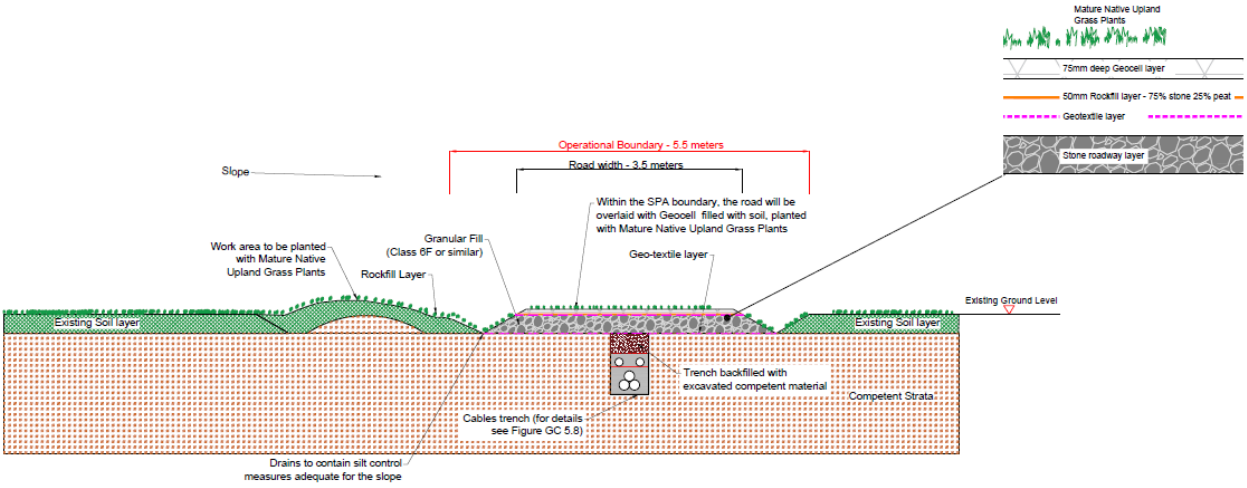


New permanent concealed floating access road through Castlewaller - **Construction Phase**

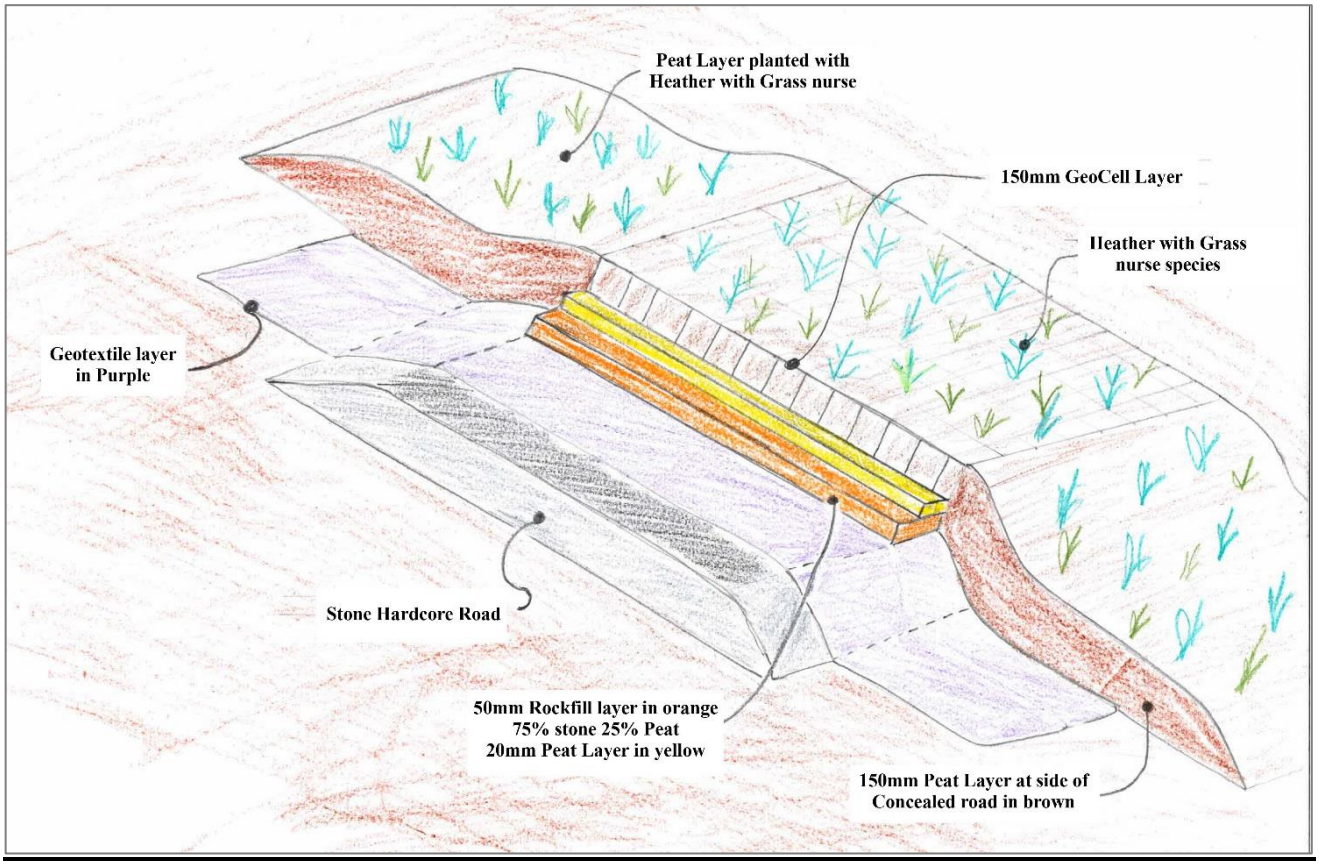
New permanent concealed floating access road through Castlewaller - **Operational Phase**



New Permanent Access Roads through Agricultural Lands inside of SPA - Construction Phase



New Permanent Access Roads through Agricultural Lands inside of SPA - Operational Phase



APPENDIX 1 – Relevant sections adapted from Scottish Natural Heritage Information and Advisory Note Number 44 *Heather re-establishment on mechanically-disturbed areas*

General principles

Heather, with or without a grass nurse component, provides a good starting point from which a diverse dwarf-shrub community may develop.

There are three principal scenarios for heather restoration:

- the soil profile will be disrupted but is at present intact and carrying heather,
- the soil profile and structure has been correctly restored but the revegetation has not been undertaken, is unsuitable or has failed,
- the soil profile and/or structure has been destroyed by compaction or incorrect restoration and there has been no revegetation or any revegetation is unsuitable or has failed.

There are five methods of restoring heather cover:

- re-turfing with intact blocks of soil and plant cover, including whole heather plants.
- using "topsoil" with its intact heather seedbank.
- direct seeding with harvested heather capsules, litter or cut material.
- nursery production of heather and planting-out.
- establishing grass cover and relying on natural colonisation of heather to follow.

Removal and replacement of turf is usually the best option for new schemes. This method permits restoration of a near full range of plant community species. It may also produce more rapid results as it largely involves vegetative regrowth of established plants. All the other methods rely on seedling germination and establishment.

Topsoil use and large scale re-turfing are normally options only if the site is yet to be excavated or if there is a potential donor site which would otherwise be destroyed. However, in exceptional circumstances, where re-turfing is likely to be the only way of restoring vegetation cover, it might be possible to take turfs from a donor site where revegetation by other methods is a realistic option If the turf area required is small, individual turfs may be lifted from within the surrounding heather matrix.

All other methods depend on the collection of seed and the provision of suitable seedbed conditions. Heather seed is very small and can be produced in great abundance. A dense, vigorously flowering, ungrazed stand of heather can produce up to 1 million seeds per m^2 and a similarly sized viable seedbank can accumulate in the top 3 - 4 cm of the soil beneath such a stand Seed production may be only 10% of this where the heather is less vigorous, patchy, or grazed.

Heather seed does not ripen until about October and most is shed from the seed capsules by late January. Both dates vary from year to year Germination requires light, warmth and moisture, but waterlogging is inimical. In the uplands most germination usually occurs in the second half of the summer. If conditions are unsuitable, seed will remain dormant and can persist in the seedbank for decades although viability varies greatly according to site conditions.

Seedlings are highly susceptible to uprooting by surface erosion, due to water, wind, or frost heave, and to grazing and trampling. They are also vulnerable to desiccation due to drought or drying winds.

The ideal seedbed for heather is:

- firm, so that seed remains on the surface where it is exposed to light,

- stable and not liable to erosion,
- clear of mobile litter which may bury seed or damage or uproot seedlings,
- moisture retentive but not subject to waterlogging,
- sheltered by adjacent vegetation, so that wind desiccation is reduced,
- not heavily shaded, though partial shade is beneficial (e g. from nurse grasses),
- fertile enough to foster heather growth without being so enriched that severe competition from grasses results.

The condition of the seedbed is central to any restoration. Direct seeding and planting-out are possible remedial treatments for both new sites and sites of incorrect or failed restoration. The presence of topsoil, although desirable, is not absolutely essential provided the substrate can be stabilised.. A grass nurse is usually regarded as essential to reduce erosion and ameliorate the microclimate.

Planting is relatively costly but reduces the risk of failure by removing the highly vulnerable seedling stage, though frost heave may still lift entire plugs. Erosion limitation measures may be required. Especially on slopes and at higher altitudes, **heather should be planted into an established grass nurse.**

All restored areas benefit from some protection from grazing animals until they are well established and they may fail if this cannot be provided.

Removal and replacement of turfs

Where there is existing intact vegetation including heather cover, the ideal is to remove it with some of the soil, store and replace. Traditional practice when cutting peats is to remove the surface vegetation as turfs about 10 cm thick and place these, roughly butted together, on to the bed of the cut area. Usually rooting takes place readily. This minimises the risk of erosion of the peat bank and loss of grazing. Stress to the plants is reduced by the immediate transfer on to a moist peat substrate. The situation is different where contractors are working on a site because it is rarely possible to remove and replace the turf in an almost unbroken sequence.

Sufficient turf depth is important to minimise root disturbance and the risk of desiccation in storage. The size of each turf is important' large turfs minimise the amount of edge at which roots are severed and the soil is exposed to drying. However, there are practical limits imposed by size and weight. Typically, the aim should be to remove turfs about 1 m x 1 m and 20 - 30 cm thick. Special equipment has been developed for use on lowland heaths in England and may be available. Otherwise, stripping will be by modified excavator bucket, with turfs loaded onto pallets which should be plastic sheeted to aid in sliding the turfs on and off.

The storage site will require preparation. While this is best located off heather (to avoid additional damage to the habitat), moving turfs long distances will cause them to break apart and adds significantly to cost. If stored on heathland, existing heather should be cut or burned and sheeted with Geotextiles so that the turfs can be deposited and lifted with minimal impact. If working in a construction corridor, the best approach is simply to lower turfs onto pallets alongside the trench. Similarly, excavated soil should be stored as a low mound along the corridor, being placed on mats, sand or Terram to protect the vegetation underneath it.

Turfs cannot be stacked. In dry weather, desiccation may occur rapidly so provision should be made to cover them or to water if required. It is essential to plan to replace turfs as soon as possible. With linear schemes, it is best to work in short sections.

Prior to replacement, subsoil must be replaced, levelled and firmed to the correct density to minimise the risk of uneven settlement. When turfs are being replaced, it is important that they are butted close and firmed to

ensure that voids do not remain. Any unavoidable gaps should be filled with topsoil Large patches of bare ground should be seeded or planted to prevent erosion.

Use of "topsoil"

Where excavation is involved and the site carries heather (and turf removal and restoration is not an option), the existing surface should be stripped and stored for reuse. It is important to distinguish between the heather litter layer plus the upper 2 cm of the humic layer which contains the bulk of seed, the rest of the humic layer which is the medium for seedling establishment, and the underlying peat or mineral soil. The seedbank may be tested by taking samples of litter and soil for germination trials. With more than 300 seedlings per m^2, or preferably more than 500 seedlings seedlings per m^2, an adequate seedbank exists. If the abundance is less, supplementary seeding may be required.

If the site is grassy and relatively fertile, reuse of the topsoil may result in dense or tall grass growth. This may either prevent heather seed from germinating or out-compete the heather seedlings *Deschampsia flexuosa* does not form a seed bank but both *Agrostis capillaris* and *Molinia caerulea* do. The latter is undesirable in restorations because of its competitive nature. If grass growth is excessive application of a selective graminicide may be beneficial. On the other hand, short open growth may provide a valuable nurse, stabilising the soil and giving wind-shelter.

Prior to litter and soil stripping, existing above-ground vegetation should be cleared by burning, flailing or, if the site is sufficiently level, by cutting with a forage harvester. The latter, if done in winter, may take a seed crop for use in re-seeding the site.

Soil stripping requires removing a thin layer of topsoil. As this is difficult to do accurately supervision at this stage is important. Care should also be exercised in wet or frosty conditions when soil structure can be seriously damaged by handling.

The soil should be stored in mounds not more than 1.5 m high for as short a time as possible, as deterioration affecting soil structure and nutrient levels takes place in the first 3 months of storage. If soil is stored on polythene or similar sheeting this facilitates subsequent removal.

Subsoils and topsoil should be replaced in sequence. The surface needs to be firm in order to aid germination, reduce water loss and reduce susceptibility to frost heave it may be firmed down by light rolling when dry to approximately its original condition. Over-consolidation must be avoided.

Small depressions offer better conditions of moisture and humidity for seedling regeneration than flat surfaces. Trampling and vehicle tyres, or the use of a ridge (Cambridge) roller, can produce these microhabitats but any deliberate use of these methods must take careful account of soil conditions as compaction on wet substrates can be damaging.

When soil is replaced, particular attention must be given to stabilising the surface, especially on slopes. In all cases, it is important to divert any lines of surface drainage flow away from the reseed, taking care not to initiate new lines of erosion. There are a number of stabilisation options, which may be combined as follows:

- Spruce, fir or larch brashings laid to make an open lattice have been shown to inhibit the movement of surface soil in wind and rain. Brashings need to lie flat as far as possible with gaps of 10 -15 cm between each twig. However, there have also been failures with poor reduction of erosion and brashings moved by winter storms Pegging down may be needed
- Open texture geotextiles such as lightweight Geojute have been used successfully. Some types of geotextile are biodegradable.
- Terracing of the slope, using timber or rock as the "risers", so as to create relatively level areas for seeding.

Liquid stabilising agents should not be used as they seem to inhibit plant establishment.

Field sowing

Most germination occurs in the second half of summer when soils are moist and warm. Seed and capsules may be spread as soon as they are gathered in autumn and will germinate after vernalisation and wetting and drying in the following summer. The earlier germination occurs the better as this ensures maximum growth and rooting before winter and reduces the risk of displacement by frost heave.

Nursery propagation (and seedbank testing) and planting out

Heather seed together with capsules and fine litter should be spread at 100 -150 g per m^2 on a 1:1 mix of lime-free potting compost and coarse sand, gently firmed into paper or fibre pots. To test topsoil for its seedbank, the soil should be thinly spread on the same compost and sand mix.

Ideally, propagation should be in a heated greenhouse kept at 18-25°C with mist sprayers to maintain moist but never waterlogged conditions. This should give 90% germination within 4 weeks. Temperature fluctuation between 18 and 25°C can aid germination.

The seedlings should be thinned so that they can be planted with a plug of rooting medium, not bare-rooted. They can be hardened off at 22 weeks and planted out at 24 weeks. If a greenhouse is not available a warm, well-lit shed or polytube will do, though germination may be delayed.

Heather can also be propagated very effectively using cuttings. Cuttings should be taken in June then grown on in peat plugs (or comparable alternative medium) in a mist unit, ready for planting out in late summer. Alternatively, cuttings can be rooted later and overwintered in the nursery before planting in the following year.

Timing of planting out is important. An early start gives plants the maximum time to develop the root system before winter. However, May is often dry and there is a consequent risk of plants dying Late June may be the optimum.

Planting density should be considered Nine plants per m^2 is about the minimum to achieve reasonable coverage in less than five years: **100% cover is not required and if 60% cover is achieved after 7 years this should be regarded a success**. For large sites it may be difficult to obtain sufficient material to plant at these densities over the whole area. If this is the case consider planting in patches within a grass matrix.

Use of grasses

Grass has several potential values. It will trap wind-blown soil particles, bind the soil while heather becomes established, and provide wind shelter In many situations, grasses form part of the surrounding vegetation cover and are therefore an appropriate component. Where heather cannot be established initially, such as at high altitudes or if insufficient heather seeds or plants are available, it may be possible to achieve or encourage a grass sward while waiting for natural colonisation by heather over the long term.

However, a potential problem on moorland is that such newly established grass is likely to be much more palatable to herbivores than the surrounding vegetation. Unless the restored area is fenced this will attract high densities of animals which may hinder vegetation recovery.

Agrostis capillaris, Anthoxanthum odoratum and *Festuca ovina* are appropriate grass nurse species. *Agrostis castellena* is another species which has been used successfully. It is a non-native species but said to be not very persistent. The Heather Trust has also used *Holcus lanatus.* As the aim is an open sward with bare ground between plants, sowing rates should be around 1.5 - 3 g per m^2 and could combine two grasses.

Seed should be sown as soon as possible after snow melt. A tested mix is, by weight, 45% *Festuca rubra rubra*, 25% *Phleum bertolonii* (cultivar S50), 15% *Agrostis capillaris* and 15% *Poa pratensis*. These grasses are non-competitive and will not spread into native moorland vegetation. Rather, mosses, heather and other plants will establish in time and ultimately displace them. The *Phleum bertolonii* is not a native upland species but is

important in the mix as the cultivar specified makes quick initial growth. Cultivars of the other species are not critical.

Sow at rates of at least 9 g per $m^2$and up to 15 g per m^2 on steeper slopes and where topsoil is absent. The high rates are required to offset high mortality and slow establishment. Where there is topsoil, rake in to a depth of 1 cm.

On small sites, it may be possible to apply turfs cut from upland grassland or grass heath. These turfs should be at least 5 cm thick and about 30 cm square. Fertiliser is not necessary. Ensure that the edges of the turfed patch are level with the surrounding ground so that they are not exposed to wind. On sloping sites, turfs will need to be securely pegged or netted in place until established. After the following winter any turfs displaced by frost heave or wind.

pH

Both correct pH and nutrient status are important. Germination of heather seeds will occur over a range of pH from 3.2 to 6.6 but for long term survival of heather plants a pH <5 is required. The pH is not usually a problem if the soil to be used has previously carried heather. If a grass nurse is to be used then a pH>3 is required. This can be achieved by incorporating limestone dust, at 100 g m-2, into the upper 5 cm of the soil.

Use of Fertilisers

The decision on whether to use fertiliser is more difficult as it will favour competing vegetation at the expense of the heather The consensus is that where heather seed is applied with a grass nurse, application of 3N:9P:9K fertiliser at 20 - 30 g per m^2 (50% slow release, 50% fast release) induces better growth of the nurse and better performance of the heather.

At high altitude and other more unproductive situations higher rates of application may be required. Ground limestone at 250 g per $m^2$and compound fertiliser (20N:20P:20K) at 30 - 40 g per m^2, plus additional ground mineral phosphate at 100 g per m^2, should be applied and raked into the surface.

APPENDIX 2: Example of Successful Heather Reestablishment in Cutover Forestry Site

CASE STUDY 14: RAE FARNBOROUGH, HAMPSHIRE

The construction of a new radio station at Pyestock Wood, part of the RAE Farnborough complex, required the clearance of 20ha of dense pine woodland which had mainly developed from an open heathland over the last 30 years. The woodland was very dense, with little surviving *Calluna* and dense bracken in places. This elevated site is an SSSI as it adjoins Eelmore Marsh which is a complex nationally important mire system.

In 1983, the proposed vegetation of the cleared 20ha, around and between the radio aerials, was a ryegrass-clover grassland established on imported topsoil. This would have required cutting up to eight times a year to keep it managed and below the 500mm maximum vegetation height specification required by the radio station.

In late 1983 an alternative scheme was put forward to use the native subsoils on the site and to establish an acidic grassland/*Calluna* heathland. The reasoning behind this was one of cost (as no imported topsoil would be required and management costs would be reduced), the reduction of potential impact on the adjacent mire system (due to, for example, nutrient enrichment) and the potential to create habitat of ecological interest which would be compatible with the site.

The project had the advantage of a field trial programme which was able to model different techniques for the establishment of target vegetation on this site. These trials ran from 1984- 1990, when the site works took place. The techniques used for the establishment of vegetation were based on the results of the experimental trials. They included the use of a nurse grass mix, based on *Agrostis capillaris, Festuca rubra*, and *Deschampsia flexuosa* and the planting of some 10,000 *Calluna vulgaris* plants. The *Calluna* plants were raised in cultivation using cuttings taken from *Calluna* plants in the Pyestock Wood area. At the time of planting the plants were in small biodegradable pots and some 50mm high. They were planted in patches, mainly on the sloping ground, at a density of 4/m2; some plants of *Erica cinerea* were also raised in the same manner. The cost of these plants was about £10,000 which gives a cost of £1.25/m2, but for material of local provenance. At this density, some 0.8ha of Calluna was planted.

The substrate was formed from a mixture of the native sandy subsoil of the site mixed with the] topsoil/organic matter (leaf-mould) from the pine woodland. The field trials had not suggested that a significant seedbank was present in the woodland soils. In certain areas, where there was no need to alter the topography of the site, the soil profile was left intact.

Hydroseeding techniques were used to apply the nurse grass mix. The field trials had indicated] that low levels of fertiliser were required and this was included in the hydroseeding mix.

Unfortunately, at the last minute, the contractor insisted that Westerwolds ryegrass was added to the grass mix to ensure that the site "greened up" before the winter (*Lolium multiflorum*). The

hydroseeding took place in September, 1990 and the heather planting in October, 1990 when the grass sward, mainly *Agrostis* was well established.

The site was then managed for the first year by cutting which avoided the *Calluna* planting areas but caused the plants to be somewhat swamped by the grass growth. Management in 1992 and 1993 has been by a single cut in late summer which has resulted in the successful elimination of *Lolium* and the control of pine invasion. The cutting is at a height of between 100 and 150mm which is a little low for the heather. Bracken is being controlled less successfully and will require control by herbicide application.

By November, 1993, there had been **an excellent survival of *Calluna* in the planted areas** where a **close to 100% cover had been achieved**. Furthermore, these areas had acted as a source of seed and much downslope spread of *Calluna* had been achieved. Ryegrass *Lolium* had been all but eliminated and the nurse sward was dominated by *Agrostis capillaris* with some *Deschampsia flexuosa*.

APPENDIX 3: Example of successful heather establishment

Bord Na Mona heather establishment trial site on mechanically cutover bog. First photo taken in 2013 showing initial spreading of heather and grass. Second photo taken showing heather establishment after 3 sessions growth. Acknowledgement to Dr Mark McCorry, Bord Na Mona.

Picture taken 2013: *Spreading of heather and brash on trial site with rock phosphate fertiliser.*

Picture taken 2016: *Excellent establishment of heather after 3 sessions growth.*